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AN

INDIAN EPHEMERIS

A.D. 700 TO A.D. 1799

SHOWING

THE DAILY SOLAR AND LUNAR RECKONING ACCORDING
TO THE PRINCIPAL SYSTEMS CURRENT IN INDIA
WITH THEIR ENGLISH EQUIVALENTS

ALSO

THE ENDING MOMENTS OF TITHIS AND NAKSHATRAS

AND

THE YEARS IN DIFFERENT ERAS, A.D., HIJRA, ŚAKA, VIKRAMA,
KALIYUGA, KOLLAM, ETC., WITH A PERPETUAL PLANETARY
ALMANAC AND OTHER AUXILIARY TABLES

BY

L. D. SWAMIKANNU PILLAI, Diwan Bahadur, I.S.O.

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OF MADRAS, AUTHOR OF "INDIAN CHRONOLOGY"*

VOL. I—PART I

GENERAL PRINCIPLES AND TABLES

A revised and enlarged edition of "Indian Chronology, 1911."

AGAM PRAKASHAN
DELHI

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PREFACE.

THE "Indian Ephemeris, A.D. 700—A.D. 2000," in eight * volumes, of which the first seven (A.D. 700—A.D. 1799) are now presented to the public, the last and eighth volume (A.D. 1800—A.D. 2000) having been published, by anticipation in 1915, is the outcome of the principles and methods expounded in the author's *Indian Chronology* (1911) for the computation of eras, tithis, nakshatras, etc. These principles and methods are re-stated, for convenience of reference, in the first volume of this work, which is practically a revised and enlarged edition of *Indian Chronology*, and is being separately published as such.

2. Its object is to show, for one thousand three hundred years, i.e., from 1st January A.D. 700 to 31st December A.D. 1999, (1) the eras in use at present in different parts of India, Śaka, Vikrama, Kaliyuga, Kollam, Bengal San, Northern and Southern Cyclic years, Hijra and A.D.; (2) the solar month and day of the Tamil and Malayālam calendars; (3) the solar months according to the *rāśis* or constellations of the zodiac; (4) the tithi for each day with its ending moment to two places of decimals, equivalent to half ghaṭikas; and (5) the nakshatra, with its ending moment; (6) the lunar months and *pakshas* in use all over India and the neighbouring countries; (7) the Muhammadan months and days of the Muhammadan months; and (8) eclipses, solar and lunar. For every one of these items the English month and day and week-day are given regularly throughout. It also contains a full exposition of a practical and at the same time accurate method of ascertaining the actual as well as the mean position of the planets, Mars, Mercury, Jupiter, Venus and Saturn for any date and at any epoch.

3. The author, having hit upon a method of calculating by a simple process, but accurately, to four places of decimals, all the elements required for the computation of a tithi (i.e., the mean ending moment of each tithi, and the appropriate sun's and moon's equations of the centre) as well as all the elements required for nakshatras (i.e., the mean ending moment of each nakshatra and the appropriate moon's equation of the centre) successively for each day, for any number of years, past or future, offered to the Government of Madras to produce (1) an ephemeris in the present form for the whole of the period for which such information would ordinarily be required by epigraphists, i.e., from A.D. 700 to A.D. 1799, and (2) an ephemeris from A.D. 1800 to A.D. 2000 for current use in Government offices. Government accepted both the offers, undertaking to pay part of the cost of compiling the former ephemeris in manuscript and to purchase 1,500 copies of the latter work which was published at the author's expense; they subsequently decided to purchase the copyright of the first edition of the *Ephemeris* A.D. 700 to A.D. 1799, and the present publication is the result of that arrangement. The author tenders his thanks to the Government of Madras for their kind patronage of both parts of the work.

4. It is a result, and at the same time an index, of the unique character of the Indian calendar system, that the only satisfactory solution of the many difficulties

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* The work, as originally designed, was to have been issued in seven volumes, including the volume for A.D. 1800 to A.D. 2000; but the addition of the present introductory volume has resulted in the division of Volume I into two parts, of which the first part is the present volume, and the second is the Ephemeris for A.D. 700 to A.D. 799, to which are prefixed (1) an explanation of the process used in the compilation of the Ephemeris, and (2) a set of illustrative dates from South Indian inscriptions. The entire work is therefore actually issued in eight volumes as stated in the text.

presented by it to the historian, the chronologist and the epigraphist, lies in the development of a day to day ephemeris such as is now presented; and any attempt to enable the historian or epigraphist to be his own computer of tithis and nakshatras seems predestined to failure. The historian has not often the aptitude requisite for undertaking such computations: and he has still less often the time necessary for making a number of alternative calculations before selecting the one that rigorously or most nearly satisfies all his data.

5. To the historian, then, of India, this ephemeris, the first of its kind, is dedicated. One wonders why the Hindus, who are so scrupulous as to the computation of the passing moment, should not have thought in the past of maintaining some kind of a continuous ephemeris like the Fasti of Ancient Rome, for verifying the allusions to the lapse of time which are to be met with in literary, and more especially in lithic, records. But history, far from being a favoured pursuit in India, was, until we come to Muhammadan times, almost an avoided subject. It is probably due to this absence of the historical faculty in our ancient men of letters that no expeditious method was ever devised for verifying calendrical details over long periods of time, and that such methods as have come down to us are of the most primitive and tedious description.* An Indian compiler of a panchanga or almanac devotes three months to the preparation of a calendar for the next twelve months and according to this method it would take over twice a hundred years to make a calendar for a thousand years. By a method which is fully explained in pages 2--5 of Part II of Volume I of the present work, the author found it practicable to compile in one day the material required for a ten years' Indian ephemeris: and since the whole of the first or preliminary compilation was effected by means of printed slips, the chances of arithmetical errors affecting the processes of addition and multiplication were also excluded by this method.

6. Few epigraphists will regret the omission from this ephemeris of the *yoga* and *ahas* which are always included in a panchanga; but many may be disposed to question the wisdom of excluding from it the period previous to A.D. 700. The paucity of verifiable Indian dates before the eighth century A.D. was the main consideration in fixing A.D. 700 as the superior limit of the ephemeris. Dr. Fleet found that for the centuries between A.D. 500 and A.D. 800 there were not more than 14 verifiable week-day dates in all the inscriptions discovered in the various parts of India and the neighbouring countries where the Indian calendar has ever been in use. He very properly, therefore, inferred from this circumstance that the week-day must have been introduced into India somewhere about the fifth century A.D. and gradually brought into common use by the eighth century. It is now conjectured by many investigators, including the present writer, that week-days *may* have been known to the Indian peoples some centuries before the fifth century A.D.: but the paucity of actual week-day dates in Indian literature and in Indian inscriptions between the fifth and eighth centuries A.D. is a fact; and it did not seem worth while, for the sake of these few dates, to add two more volumes and the cost of producing them to the bulk and expense of the present publication. The discovery of a new week-day date in any of these early centuries, when the week

* To the same cause is due the singular lack of ability (commented on in Chapter V of Volume I of this work), on the part of literary men with undoubted general information, like the annotator of *Paripādal*, to grasp the historical import of a date referred to by its astronomical details. Likewise it is a mystery why in other cases such annotators, while supplying details sufficient to identify a date, failed to give the date itself. In the body of, and in appendices to, this work, reference is made to three such dates, to be found respectively in Silappadhikāram, Jivakachintāmani and Paripādal.

was as it were on its trial in India, would be so interesting an event that expert attention could not fail to be directed to it. The author has, in the first volume of this work and the tables appended thereto, furnished methods of computing such dates to any desired degree of accuracy according to any one of four siddhāntas, the Sūrya siddhānta, the first Ārya siddhānta, the Brahma siddhānta and the Siddhānta Śiromaṇi.

7. In preparing a second edition of the author's *Indian Chronology* (1911) for the first volume of the present publication, numerous changes were found necessary, some in the direction of simplifying, and others in that of amplifying, that work. Of late years the attention of the public has been drawn to the desirability of occasionally employing Indian systems other than the Sūrya siddhānta in verifying Indian dates. The author has, therefore, now not only amplified his original Sūrya siddhānta Eye-table, but also devised similar eye-tables for the first Ārya siddhānta, the Brahma siddhānta and the Siddhānta Śiromani. For the reason stated on page 77 of Volume I of this work it did not seem necessary to deal specially with the second Ārya siddhānta.

8. Secondly, the investigation of ancient planetary records, called horoscopes, will, it is confidently hoped, be furthered by the large amount of space devoted to the subject in the present work ; in fact, certain aspects of it, such as the planetary eye-tables and the perpetual planetary almanac, are for the first time now presented to the public and at least one problem of first-rate importance in Tamil literary chronology has been successfully solved by their means.

9. Several readers of *Indian Chronology* in its first edition having complained of the absence of a popular and at the same time compendious exposition of the leading principles of the Indian calendar, the author has endeavoured to supply the want by means of Chapter II of Volume I of the present work, "Exposition of the eye-tables" which, with the eye-tables themselves and the illustrative problems prefixed to them, will be found a small but self-contained treatise on the subject.

10. The tables in the first volume of this work have been regrouped for the present edition and reduced in number to six, the most important being Tables II, III, IV and V. The author had entertained an idea that upon the appearance of his ephemeris for A.D. 700 to A.D. 2000, Table II (which was table X in the first edition) could be dispensed with and a considerable amount of space thereby saved : he has since found, however, that for applying the *other* siddhāntas to the computation of tithis, nakshatras and yogas, Table II is indispensable and he has been obliged to retain it accordingly. Eclipses, solar and lunar, are dealt with in Chapter V, section v and in Table IV-L, from a practical point of view, viz., to the extent necessary to enable the student to satisfy himself whether an eclipse was possible or probable on dates anterior to the earliest year for which *Oppolzer's Kanon der Finsternisse* is available, 1207 B.C.

11. Several papers by the author which students of Indian Chronology occasionally ask for, but which hitherto either were not printed or were available only in private circulation, have now been included in the appendix ; and a copious list of South Indian dates, fully verified and arranged in order of dynasties, is prefixed to Part II of Volume I of this work, by way of illustrating the practical use of the Ephemeris in historical investigation. Among papers now printed for the first time is Paper No. (i) appended to Volume I, Part I on the Vedānga Jyotisha,

containing the substance of the Sir Subrahmanya Ayyar lectures delivered by the author in 1916 at the request of the Madras University.

12. In the preface to the first edition of *Indian Chronology* (March 1911) the author expressed his obligations to previous writers, particularly to Professor HERMANN JACOBI (of Bonn and Heidelberg), who is unquestionably the greatest authority on the subject. The exact connexion between this work and Professor Jacobi's Tables in *Epigraphia Indica* is brought out in Chapter IV "Construction of Tables." The rules on page 3, paragraph 12, regarding the commencement of the civil solar month in various parts of India were taken from the *Indian Calendar* by Messrs. R. SEWELL and S. B. DIKSHIT; in the present edition the author has also used Dr. Schram's calculations of the śodhya as reproduced in Mr. R. SEWELL'S *Indian Chronography*.

MADRAS,
January 1922.

L. D. SWAMIKANNU.

AN INDIAN EPHEMERIS, A.D. 700 TO A.D. 1799.

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AN INDIAN EPHEMERIS
(A.D. 700 TO A.D. 1799)

VOLUME I.—PART I.

CHAPTER I.—PRELIMINARY NOTIONS.

SECTION i.—*The siddhāntas.*

Every Indian calendar or panchānga follows a particular siddhānta or system of astronomical constants. Varāhamihira, an astronomer of the sixth century A.D., has described five principal siddhāntas in his *Panchasiddhāntika* (Ed. Thibaut, with English translation), and Dr. J. Burgess, at p. 722 of J.R.A.S. (1893) enumerates eight principal siddhāntas. The siddhāntas which have so far been investigated in detail are, (1) the Sūrya siddhānta, (2) the first Ārya siddhānta, (3) the second Ārya siddhānta, (4) the Brahma siddhānta, and (5) the Siddhānta Śiromaṇi. It is a mistake to suppose that one siddhānta differs from another as the Ptolemaic system differs from the Copernican. On the contrary the basic principles of all the siddhāntas are the same and they differ from one another only in the astronomical constants or lengths of the fundamental periods used in computation. The slight variations among the siddhāntas, which affect the computation of tithis, nakshatras and yogas, are made manifest by means of the different Eye-tables in the present volume, pages 153 to 194 and the footnotes on pages 200 to 279. The following calculations show that in the most important period A.D. 900—A.D. 1400, which we may call the period of epigraphic chronology, or briefly the epigraphical period, the extreme variations seldom exceed the tenth part of a day :—

English equivalent of the moment of occurrence of mean new moon at the beginning of Vaiśākha lunar month in	Sūrya siddhānta.	First Ārya siddhānta.	Brahma siddhānta.	Siddhānta Śiromaṇi.
A.D. 400	April 10·3304	April 10·3145	April 10·3252	April 10·3730
A.D. 900	April 2·4862	April 2·4871	April 2·4446	April 2·4993
A.D. 1400	March* 25·6421	March* 25·6734	March 25·5640	March 25·6255
A.D. 1900	April 29·3285	April 29·3903	April 29·2140	April 29·2824

2. *Sūrya siddhānta.*—Of the several siddhāntas referred to above, the Sūrya siddhānta is the one system which has found universal acceptance in India, and it has been adopted by almanac-makers through the length and breadth of the Indian Continent for at least a thousand years past; so that, in verifying any date in an Indian inscription, copper-plate, or literary work during this period, the principles of the Sūrya siddhānta have to be applied in the first instance, and only if they fail, has the applicability of any other siddhānta to be considered. In Southern India alone, and even there, only in respect of sankrāntis, i.e., the commencement of solar months, the first Ārya siddhānta, a system generally referred to the fifth century A.D., has been in use for a long time past. Elsewhere, and for all other purposes, the Sūrya siddhānta may be said to be in use, and to have been in use, universally, throughout India.

3. Since panchāngas, based on the Sūrya siddhānta, are still the most popular ones in India, it may be affirmed that the Indian people, as a whole, are satisfied with its results to-day, just as they were satisfied with them a thousand years ago. New moons and full moons and the sun's tropical longitude, as well as eclipses, may still be calculated, with a very fair amount of precision, with the

* This was not the Vaiśākha new moon by the Sūrya and Ārya siddhāntas, but for the present purpose this discrepancy may be neglected.

sole help of tables based on the venerable Indian system of the Sūrya siddhānta. As a system of pure chronology, too, it has probably not its equal anywhere in the world. Chronology is based on astronomy; but while astronomy is studied in the laboratories and observatories of mathematicians, chronology is meant to be applied and used everywhere. The chronological system of the Sūrya siddhānta, though complicated in appearance, and incrusted with astrology, in which the author has no belief whatsoever, is yet, when released from its accidental encumbrances, sufficiently simple, and its terms and methods have, by dint of use, been rendered familiar to the Indian people at large. If for no other reason, at least for the sake of its antiquity and on account of its use in the interpretation of ancient Indian dates and in the reconstruction of Indian history no less than in the regulation of present day practice over a great part of India, such an ephemeris as the present one, based mainly on the Sūrya siddhānta, deserves to be on record.

Section ii.—*Main features of present method.*

4. According to the author's method, the turning points of the solar and lunar reckonings of time are (1) the moment of commencement of the Indian solar year, and (2) the moment of occurrence of the first new moon in the solar year. Both moments *might* be reckoned from 0 Kaliyuga which for *Sūrya siddhānta* was the midnight between 17th and 18th February 3102 B.C., and for other siddhāntas the moment of mean or Lanka sunrise (6 a.m.) on 18th February 3102 B.C. The moment of 0 Kaliyuga was also a moment of new moon, that is, the mean longitude of both sun and moon was then 0°. But for the purposes of the present system, the commencement of the year 0 Kaliyuga has to be taken back, by 2·1707 days in the case of the Sūrya siddhānta and by a similar period in the case of each of the other siddhāntas. This period is called the *śodhya*, which is defined as the interval between the moment when the sun reaches 0° true longitude and the moment, rather more than two days later, when he reaches 0° mean longitude every year. The śodhya is dealt with fully in paragraphs 198 to 213 below, and the tables appended thereto. It will be seen from the different Eye-tables that even where there is no other difference between two siddhāntas (e.g., between Brahma siddhānta and Siddhānta Śiromaṇi), the difference in respect of the śodhya makes two tables necessary for computing the commencement of the solar year and the first new moon in each solar year. See also paragraph 191 below.

5. The interval between the commencement of a solar year and the first new moon in the solar year is a most important datum in the author's method, since on this interval depend (1) the time of occurrence of subsequent new moons in the year, (2) the incidence of *adhika* and *kshaya* months, (3) the exact interval between the ending moment of a particular tithi and the ending moment of its attendant *nakshatra* or *yoga* and (4) the calculation of solar and lunar anomalies for tithis.

6. Another important respect in which the author's method differs from all the others hitherto published for computing tithis, nakshatras and yogas, is the series of anomaly and equation tables (Eye-table, sections **e** to **i**, pages 171—194) for the sun and the moon under the various siddhāntas, whereby the absolute ending moment of a tithi, a nakshatra or a yoga, is arrived at by means of a single addition to, or subtraction from, the mean ending moment, instead of by a series of approximations. How this is effected will be explained in Chapter IV on the construction of the tables, Section iii, pages 74 to 81.

Section iii.—*Luni-solar character of the Indian year.*

7. Like the lunar calendar of the Jews, and unlike that of the Muhammadans, the Indian calendar may be described as luni-solar, since such of its periods of time, as are regulated by the movements of the moon, are also tied to divisions of the solar year. A lunar tithi is not counted at all unless the *sun* rises upon it. A tithi, nakshatra, or yoga may begin, or end, at any moment of the day, but the tithi, nakshatra, or yoga pertaining to a day is that which is current *at sunrise*. A lunar month has its name determined by, though not always

etymologically derived from, the next following *solar* sankrānti: if there are two lunar months equally entitled to have their name determined by a particular solar sankrānti, they both receive the same name and one, the first, is called *adhika*. On the other hand, if a new moon is followed by two sankrāntis before it is followed by another new moon, the lunar month which would ordinarily have had its name determined by the second of the two sankrāntis is suppressed and is said to be *kshaya*, that is, in defect. Lastly the lunar year, beginning with the lunar month Chaitra, is named after the *next solar year*. These considerations suffice to prove that the Hindu lunar year is properly a luni-solar year.

8. Lunar periods of time are characterized by an element of certainty or rather of palpable evidence, not found in solar periods, and in another sense the actual moments of lunar phases are marked by much greater uncertainty than solar sankrāntis. We shall consider each of these propositions.

9. *Palpable evidence of lunar periods.*—We cannot visibly perceive in the heavens the fact that the sun has completed any definite stage in his annual course: but new moon, when the moon's longitude is the same as the sun's, is a patent fact: so are full moon and each quarter of the lunar month. There cannot be a difference of a whole day between the moment of new moon in one part of the country, and the same moment in another part, just as there might be in the commencement of a solar month (paragraph 14 below). If an inscription states that a certain tithi fell on a Monday, and by calculating backwards we trace the tithi to a Saturday, we may be quite certain that there is some error in the inscription.

10. On the other hand, there are greater fluctuations in the moon's than in the sun's movements, in the sense that the actual time of new moon may be as much as 14 hours before, or 14 hours after, the time of *mean* new moon. Two calculations are therefore necessary to determine the time at which the moon reaches any particular stage of her course: we must first ascertain the *mean* time, which is simply the expected time, taking an average over very long periods; and then we must calculate the *actual* time by means of a correction of the mean time according to the moon's and sun's *anomaly* at the particular moment. Both these operations can be performed very easily and very accurately, that is to say, in exact accordance with the siddhāntas, by means of the Eye-tables in the present work. The correction is called in modern astronomy a correction for the sun's and moon's *equation of the centre*. There are also one or two other minor corrections recognized in modern astronomy, but the siddhāntas do not make them.

SECTION iv.—*Commencement of the solar month or sankrānti.*

11. The astronomical commencement of a solar month is the moment of *sankrānti*, i.e., the moment when the sun enters a constellation of the zodiac. To ascertain the moment of sankrānti, we must add up two figures, namely, (1) the day and fraction of day of the English month entered in Table II or in the head lines of the Ephemeris against "Commencement of the solar year," and (2) the days and fraction of day entered in the Eye-table, section a or in the book-marker as the collective duration of days up to the month of which we wish to know the sankrānti or moment of commencement.

12. Though the moment of a sankrānti is the same all over India for the same siddhānta, the commencement of the corresponding month for *civil* purposes is not necessarily the same all over India. The following rules on the subject are adopted from Messrs. *Sewell and Dikshit's* "Indian Calendar":—

(1) In Orissa the solar month of the *Amli* and *Vilāyati* eras begins on the day of sankrānti, at whatever moment of the day the latter may happen. Accordingly in Orissa, the solar months begin on the sankrānti days.

(2) In Bengal, when the fraction of the day at which the sankrānti happens does not exceed 45 ghaṭikas (midnight) the solar month begins on the next day; and when the sankrānti occurs after 45 ghaṭikas, the solar month begins ou the next day but one. Accordingly the Bengal months corresponding to *Āni* A.D. 1910 (Bengal solar *Āshādha*) and to Malayālam *Dhanus* A.D. 1910 (Bengal.

solar *Pausha*) commenced on 15th June and 16th December 1910 respectively and not on 14th June and 15th December 1910 (the days of the sankrānti), while Bengal solar *Māgha* in A.D. 1910–11 did not commence till 15th January 1911 (i.e., two days after the sankrānti).

(3) In Southern India, in the Tamil country, when the fraction of the day at which the sankrānti occurs does not exceed 30 ghaṭikas (i.e., when the sankrānti occurs, roughly, before sunset) the solar month begins on the same day. That is why, for instance, the beginning of Tamil *Āni*, A.D. 1910, coincided with the day of the sankrānti, 14th June 1910. When the sankrānti occurs after 30 ghaṭikas, the solar month begins on the next day. Examples will be found on any page of the Ephemeris. The authors of the "Indian Calendar" also state that in Malabar, when the sankrānti occurs after 18 ghaṭikas, the solar month commences on the next day.

Section v.—*The day of the solar month.*

13. This citation, so familiar in the European calendar, is unknown in India, in the epigraphical period, except in Southern India, and even there it occurs only in a small number of cases. When it does occur, it is a valuable means of verification, provided we know the particular siddhānta to be applied: because the combination of a particular solar day of a month with a *vāra* or week-day, a particular tithi and a particular nakshatra, may not recur for a century or possibly for four centuries. On the other hand, if we laid too much stress on the solar day of the month, and were wrong in the assumption of the siddhānta, our result might be wide of the mark by a century or two. This risk of error has been amply illustrated in a recent pamphlet* which shows that a whole series of Chōḷa and Pāṇḍya dates could be transposed by a century by merely supposing the Brahma siddhānta to have been followed, instead of the Ārya siddhānta and that another similar transposition could be effected by following the "Orissa rule" for the commencement of a *sankrānti* (vide paragraph 12 supra) instead of the "Tamil rule." The author of that brochure, however, overlooked the important consideration that if in even one of a series of such dates mutually connected in time, there was a reference to a śaka date, which confirmed the Ārya siddhānta and the "Tamil rule" hypothesis, then it must follow that no other siddhānta and no other "rule for sankrāntis" can be applied to the whole series.

14. Owing to various causes, principally the differences in the length of the solar year, in the sun's śodhya, in the sun's anomaly table, and in the "Sankrānti rule," the day of solar month by a particular siddhānta is often (and in the case of the Brahma siddhānta, regularly, during the epigraphical period) discrepant by a whole day from the result arrived at by using another siddhānta, and if both siddhānta and the sankrānti rule (paragraph 12) were varied simultaneously, a difference of two days in the result could be produced. But not only does the bewildering array of siddhāntas and sankrānti rules *not* cause in practice a multiplicity of solutions and a general uncertainty of dates;—the thesis propounded in the pamphlet just referred to,—but the application of the Ārya siddhānta and the "Tamil rule" to the whole series of dates receives more ample confirmation than before by the mention of śaka dates in some of the inscriptions which by internal evidence are mutually connected in time. (See the Pāṇḍya dates in Part II of Volume I).

15. It must not also be overlooked that palæographical tests are in almost every case absolutely indispensable to verify a date, and where the period is such that a difference of 100 years makes a difference in the kind of script in use (as was the case, for instance, in A.D. 1100 compared with A.D. 1200 for Tamil script), the astronomical verification should be kept within the bounds of palæography and not stray into any century *ad libitum*.

Section vi.—*The week-day.*

16. The week-day is the crucial test in the vast majority of verifiable Indian dates and in the absence of a week-day, an Indian date is usually pronounced

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* "Some śaka dates in inscriptions" by Mr. Venkatasubbayya of the Mysore Archæological Department, 1916.

unverifiable * unless there is an eclipse in the date. To "verify" a date is to show that it is equivalent to a particular day, month and year consistently with all its details, or with the greater number of its details, and that it would be inconsistent with any other day *during a certain number of years*. For instance, a date, such as "Monday, 8th tithi in the bright fortnight," with mention of month, or "Monday, 8th tithi and nakshatra Anurādha," without mention of month, can be verified as a rule only for a period of 3, 7 or 10 years, because after this period it will recur with the same details. If in such a case the year also is given, it may be possible to show that all the details are consistent with the given year and not with any other year for the next 3, 7 or 10 years, so that it becomes probable that the year given in the date is correctly cited. Where we have a date that merely gives a tithi, a nakshatra, and a year, without the week-day, we say that the date cannot be verified, i.e., *proved* free from the probability of error, because every year must contain such a tithi and such a nakshatra somewhere, and we cannot assert with any degree of confidence that the year-date is free from error. Numerous examples of verifiable and unverifiable dates are given in the introduction to the second part of volume I of the Ephemeris.

17. The week-day appears to have been frequently relied on in inscriptions to distinguish the day on which a tithi or nakshatra commenced from the day on which it came to an end.

Section vii.—*The tithi or nakshatra of a day and of a moment.*

18. Over the greater part of India, a day is known normally as the day of an eighth, ninth or any other *tithi*, or of Aśvini, Bharani, or any other *nakshatra*, rather than as the eighth, ninth or any other day of a solar month as in Europe. The tithi or nakshatra which is identified with a day is that tithi or nakshatra which was current at sunrise on the day in question, and though a tithi or nakshatra may have ended the next minute after sunrise, and the next tithi or the next nakshatra may have been current for the whole of the remaining day, it is the tithi or nakshatra current *at* sunrise which gives its name to the day in *ordinary* Indian parlance.

19. Nevertheless it is the case that in numerous well-attested inscriptions, the tithi or nakshatra quoted is not that which was current at sunrise on the day in question but that which commenced at some part of the day and would be current at sunrise only on the *next* day. Such a citation may be distinguished as the day of *commencement* of a tithi or nakshatra or "the following day's tithi" or "the following day's nakshatra" (usually abbreviated by the present writer as *f.d.t.* or *f.d.n.*).

Section viii.—*The civil day and its English equivalent.*

20. Indian time is kept in ghaṭikas (Tamil nāḷigai), or sixtieth parts of a day, each *ghaṭika* being equivalent to 24 minutes of English time ($\frac{2}{5}$ of an hour), and in *palas* (Tamil *vināḍis*) or sixtieth parts of a ghaṭika, each *pala* being equivalent to 24 seconds of English time. The *ghaṭikas* and *palas* are reckoned, not from midnight to midnight as in English time, but from sunrise to sunrise. Now, as the moment of sunrise depends on the latitude and longitude of each place, there should, strictly speaking, be as many *panchāngas* as there are places in India. Indian astronomers get over this difficulty by calculating time in the first instance according to one central latitude and longitude, and then applying the necessary corrections in order to deduce the time for other places. The central latitude is the equator and the central longitude is that of Ujjain (75° 46′ 6″ east of Greenwich) where there was an ancient observatory. To combine the central latitude and the central longitude, they imagined an island called Laṅkā in the Indian Ocean, situated on the equator and having the same longitude as Ujjain. This Laṅkā is, of course, not Ceylon.

21. The civil day (with its multiple, the week) is the one measure of time that is common to European and Indian reckoning, everything else (year, month, ghaṭikas, palas, hours, minutes, seconds) being different in the two systems. Accordingly, the civil day and decimals of a day have been adopted throughout the present work for expressing all manner of Indian dates as well as for working out

* For the verification of an eclipse without a week-day when the positions of five planets are recorded, see Chapter V, section ii, paragraphs 247 to 271 below.

ending moments of *tithis*, etc., and also for verifying the correspondence of English and Indian dates. Any decimal of a day can be converted readily into Indian *ghaṭikas* and *palas* (Tamil, *nāligais* and *vināḍis*) or English hours, minutes, and seconds by means of the Eye-table **r** or Table VI or the book-marker inserted in each volume of the Ephemeris. To assist the reader in very exact computation, the fractions expressing minutes have been carried far enough in Table VI to show the recurring places. If, for instance, we wish to know how many hours, minutes, and seconds are equivalent to ·40490 of a day, we turn to Table VI and find that ·40486 of a day is equal to 9 hours 43 minutes. The remainder of the decimal fraction is ·00004 which, the same table informs us, is between 3 and 5 seconds. So the answer is 9 hours 43 minutes 4 seconds. The same decimal fraction is equivalent in Indian time (as we may see from Table VI) to 24 ghaṭikas, 18 palas..

Section ix.—*Mean and actual moment of phenomena.*

22. The most ordinary problem in the Indian calendar is, to determine when a particular astronomical phenomenon was completed, e.g., an elongation of the moon from the sun measured in arcs of 12 degrees each and shortly called a *tithi*; the reaching of a longitude of so many degrees by the moon, called a *nakshatra*; the completion of so many degrees of longitude by the sun and moon, supposed to travel in opposite directions, called a *yoga*; or the actual completion of so many degrees by the sun, called a sankrānti, when the number of degrees is computed by *rāśis*, i.e., in multiples of 30 degrees. There is no *direct* means, known to ancient or modern astronomy, of computing these ending moments, as they are called, because at no two successive moments does any heavenly body move at the same rate or pace. Nevertheless the "anomalies," as they are hence called, can be tabulated, because, taking long periods into consideration, the mean period of revolution of a heavenly body, e.g., the moon or any of the planets, is fairly, and for all practical purposes rigorously constant, and we have only to attach to each "anomaly" its own "equation," or, variation from the mean. In other words, the answer to the question, what is the actual position of a heavenly body at any moment?—is furnished by the algebraical sum of the *mean position* and the *equation*, corresponding to the *anomaly* at that moment. It will be seen, however, from what follows that the Indian calendar aims at determining more than this: it requires not only the phase or phenomenon completed at a given moment, for which purpose we would have to add merely the mean phase of a moment *plus* the *equation* of the *anomaly* at that moment, but it requires the *ending moment of every phase*, for which purpose the ordinary anomaly tables have to be manipulated in a particular way. The exact method how this is done will be explained later (paragraphs 195, 196, p. 76), but it was thought as well to draw attention to this peculiarity of procedure in computing the details of the Indian calendar.

Section x.—*Explanation of headings and columns in the ephemeris.*

23. *Method of verification and abbreviations.*—The chief abbreviations used in the ephemeris are (1) the indication of ending moments of tithis and nakshatras as decimals of a day, instead of by *ghaṭikas* and *palas*, or hours and minutes; (2) the substitution of numbers for names of nakshatras. A key to the latter set of abbreviations will be found at the bottom of each page, while a key to the former has been inserted in each copy of the work as a detachable book-marker as well as on the inner side of the cover. For the rest, all the Indian and Muhammadan details corresponding to an English date are given *in its immediate neighbourhood.* Thus in the twenty days commencing with Tuesday 12th December A.D. 836 and ending with Sunday 31st December, there are several changes of Hindu and Muhammadan months, there is one day without its own tithi, one day without its own nakshatra, and one day with two tithis. All these changes and facts are visible at a glance without having to be gleaned with much trouble, from the top, bottom and sides of the page, as in an ordinary Indian panchānga. Thus on Tuesday 2nd December A.D. 836, it is clearly indicated that it was the 20th day of *Dhanus* or *Mārgaḷi* month of Anala year, and *bahula panchadaśī* or *amavāsyā* of Lunar *Mārgaśirsha* ending at ·12 (= 7 ghaṭikas or 3 hours after mean sunrise),

a day of nakshatra "Purva Āshāḍha" (No. 20) ending at ·58 of day (= 35 ghaṭikas, or 14 hours after mean sunrise), and lastly the 28th day of *Zi-l-hijja* month of Hijra 221. It is equally clear that Friday 22nd December was the first day of *Makara* or *Tai* month of the same year *Anala*. The change from the last day of Hijra 221 to the first day of Hijra 222 on Thursday 14th December A.D. 836 is marked with equal clearness.

24. *Cyclic and other years.*—The headings at the top of each page comprise (1) the symbols for solar and lunar eclipse and the abbreviations for *Amāvāsyā* and *Paurṇimā*, (2) the numbers of years in the different eras, (3) the names of samvatsaras or cyclic years in Northern and Southern India, and (4) the commencement of the Indian year according to *Sūrya* and *Ārya siddhāntas*, according to the *Kollam* year, and according to *Hijra*. The *Kollam* year is a current one, like the A.D. year, while all the other Hindu years, Śaka, Vikrama, Bengal san and Kaliyuga, are expired years. It should be noted that the Kaliyuga years quoted in the ordinary South Indian panchāngas are current and will be found to exceed in each case the Kaliyuga year marked in this book by one. A similar remark applies to Bengal san. The names of solar samvatsaras, *Prabhava*, *Vibhava*, etc., are quoted not only at the top of each page, but above the name of each Tamil month. Thus it has been possible to give in this book, for each English date, the Tamil (or Malayālam), Telugu (or Kanarese) and Muhammadan equivalents with as much fulness as in the ordinary pocket diaries. For example, against Tuesday 21st March A.D. 836, one may read off in this book, as in a pocket diary, "*Anala* Samvat, *Chittirai* 1" or "*Meṭam* 1," "*Anala* Samvat *Adhika Chaitra* Bahula Panchadaśī, Nakshatra Revati, and Hijra 221 Rabī-ul-awwal 28."

25. *Solar and lunar reckonings.*—The various calendar systems in use in India may be divided into two main groups as shown in this book, namely, the solar reckoning, comprising the English, Tamil, Malayālam, Oriya and Bengali reckonings; and the lunar reckoning, used all over India, and including the Muhammadan and Jewish reckonings. The Indian calendar is sometimes styled luni-solar, because its lunar months and years cannot recede by more than 29 days from the corresponding solar months and years, whereas the Muhammadan or Hijra year recedes by 10 or 11 days every year and will therefore be found to commence in all months of the Indian and English years.

26. *Column headed "Month and day."*—Solar months in India are generally named in Sanskrit after the rāśis or signs of the zodiac, "Mesha," "Ṛishabha," etc., but in Tamil they are also known by another set of names, more or less modified from names of nakshatras or lunar months, namely, "Chittirai," "Vaikāśi," etc. Both sets of names, "Mēsha-Chittirai," "Ṛishabha-Vaikāśi," "Mithuna-Āni," etc., are quoted in this column. The days of the solar month are reckoned according to an ancient Tamil practice, from the sankrānti of the *Ārya* siddhānta. The rules for determining the commencement of the solar month, according to the Tamil, Malayālam, Oriya and Bengali systems, with examples. have been given in paragraph 12 *supra*. A difference of a whole day or of two days would ordinarily be found between Tamil days of solar months and the corresponding Bengali days.

27. The number of days in a Tamil month is not the same every year. Thus Chittirai has ordinarily 31 days, but may occasionally have 30. The fact, alluded to by the ancient commentator of *Śilapadikāram*, that Chittirai, in the year when the events described in that poem occurred, had only 30 * days, and commenced on a Sunday, a day of "Svāti" nakshatra, enables us, although the commentator has omitted to mention the year, to infer that the year in question was A.D. 756 and no other. Days of the solar month are now commonly quoted in the Tamil country, but we do not meet them before the beginning of the eighth century A.D. We learn from the ancient Tamil poem *Tolkāppiyam* that a day at that epoch was ordinarily called, as it still frequently is, after its nakshatra. The practice of calling days by their tithi numbers apparently came into use at a subsequent date in the Tamil country, though elsewhere in India the calling of a

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* In volume I of this *Ephemeris*, the Chittirai month of the year A.D. 756 is shown as having had the full 31 days; but the author has shown elsewhere (vide Paper iii in the Appendix) that according to the system then current it was quite possible for Chittirai to have had only 30 days.

day by its tithi number is an ancient, in fact, a Vedic practice. Week-days do not seem to have been in common use in the Tamil country much before the beginning of the eighth century A.D. Elsewhere in India, week-days have been traced to the fifth century A.D., but not much beyond. It is a curious circumstance, and one deserving of careful study, that a date in India, one thousand and four-hundred years ago was known by the same week-day as the corresponding day in Europe.

28. *Nakshatras and tithis.*—Every Hindu feast, fast and festival (except sankrāntis) is connected with either a tithi or a nakshatra or both (Chapter III, Section xix, pp. 55—69). A mean tithi extends over ·98 of a day, while a mean nakshatra extends over 1·01 days; but the solar and lunar anomalies may make a tithi longer or shorter by ·58 of a day as a maximum, while the lunar anomaly may similarly affect a nakshatra to the extent of ·38 of a day. Hence the irregular lengths, in time, of tithis and nakshatras, which make the Indian system so complicated in appearance, but which constitute at the same time a most valuable check in chronological studies. Hence also the curious fact that what ought to be a normal state of things, namely, each day having a single tithi and a single nakshatra, is very seldom noticed on the successive days of a *whole* month. Such a phenomenon occurred throughout the month of Vaiśākha, Wednesday 26th March to Friday 25th April A.D. 822 and again, throughout the month of Phālguna, Saturday 26th February to Monday 28th March A.D. 830. The curious reader may pursue the game with the help of this book. It follows from what has just been stated that in the course of a lunar month 2 tithis or 2 nakshatras may ordinarily be found either to occur on the same day or to cover parts of 3 days, the middle day in the latter case being without a tithi, or without a nakshatra of its own. Cases of the same day having two tithis *as well as* two nakshatras, as on *Kārttika, bahula* 11 and 12 (Wednesday 30th October A.D. 709), and other cases (e.g., Saturday 27th June A.D. 705) in which a day had neither a tithi nor a nakshatra of its own can be easily traced with the aid of this work.

29. In this connexion reference may be made to the hallucination that a lunar fortnight with only 13 days does not occur except once in a 1,000 years. In the *Mahābhārata* (*Bhīshma parva*, 3, 32) it is recounted by Vyāsa in the course of his conversation with Dhṛitarāshṭra that he has known of lunar fortnights consisting of 14, 15 or 16 days, but never of one consisting of 13 days, but that since such a one is in prospect or has occurred, there will be a great slaughter of human beings. Other Śāstras, quoted by Dr. Fleet in *Indian Antiquary*, Vol. XVI, for March 1887, reiterate this omen, and it is stated in one of the quotations (commentary on the *Muhūrta Ganapati*) that the phenomenon occurs only once in 1,000 years. *If this was the case*, it would be at least a remarkable coincidence that the recent great European War (A.D. 1914—1918) should have broken out absolutely at the middle of a fortnight consisting of 13 days. The fortnight from *śukla pratipad*, Friday 24th July, to *pūrṇimā*, Tuesday 4th August A.D. 1914, as will be seen from the "Ephemeris A.D. 1800—A.D. 2000," comprised only 13 days from *pratipad* to *punchadaśī* owing to the occurrence twice, i.e., on the first and on the last day of the paksha, of two tithis on a single day. *But it is not true that the phenomenon takes place only once in a thousand years.* In the absence of a compilation like this Ephemeris, it might be difficult to check the statement, but anybody can satisfy himself from this Ephemeris that the phenomenon occurred in 1805, 1813, 1830, 1847, 1849 (after 36 years as in the Mahâbhârata, *Mausala parva*, 11, 18, and with *grasthodaya* and *grasthāsthamana* also as in the Mahābhārata), 1861, 1864, 1872, 1878, 1880, 1892, 1900, 1903, 1914, 1917, 1920 and will occur in 1928, 1931, etc. Such instances will be found also in the earlier parts of the present work, see for example the years 702, 705, 719, 724, 741, 744, 752, 755, 758, 772 and 775. Comment is needless after noting so many recurrences. The occurrence of such a fortnight in July 1914 was known in January 1914 when the new year's panchāngas were published; nevertheless, no one then predicted that a great war was coming on in July: the "prediction" came after the event.

30. *Adhika and Kshaya months.*—Occasionally, that is seven times in 19 years, a lunar month is repeated twice in the course of the same year. For

instance, in the year A.D. 836 there are two Chaitras, one reckoned from Monday 21st February to Tuesday 21st March, and the other from Wednesday 22nd March to Wednesday 19th April. The first month in such cases has the prefix *adhika* (=additional), and the second the prefix *nija* (=proper). Both prefixes are duly and clearly marked in the Ephemeris. More rarely also, a lunar month is suppressed altogether, and in such cases is known as *kshaya* (=suppressed). Thus in A.D. 770, the month *Pausha*, which ought to have occurred in December-January, was suppressed. The omission of a kshaya month is noted by N.B. at the foot of the page where required. The rules for determining the date of occurrence of additional and suppressed months are clearly given in paragraphs 89 to 91 below.

31. *Nakshatras and ending moments of nakshatras.**—A complete list of Indian nakshatras, with the corresponding fixed stars, as identified by different authorities, is given in Chapter III, paragraph 101. The practice of reckoning time by nakshatras is peculiar to India and China, and has existed in each of these countries from very ancient times. In India, in Vedic times, a lunar month had no other name than that of the nakshatra in which the moon of that month became full. To this day, *Chaitra* is the month in which the moon becomes full when occupying "Chitrā" nakshatra, and so on for the other months. The concurrence of certain tithis with certain nakshatras is thus fixed within narrow limits for every month in the year, and the student of inscriptions should be familiar with the table of concurrence (see the *Eye-table*, section **S**, pp. 140, 146, 152 below.)

32. *Note on broken periods.*—It is very important that the reader, dealing with the Indian or any other calendar, should know thoroughly how to reckon broken periods. It is generally a question of addition or subtraction, but unless one goes through the process with reflection, there is always a danger of adding or subtracting 1 too much.

To take the simplest case, how many days are there from Friday in one week to Tuesday in the next? Most people would use their fingers in such a case and answer "4" or "5" according as they began the reckoning with Friday or with Saturday. Now, such uncertainty is fatal to exact reckoning, and we should therefore follow certain rules whereby we may avoid all uncertainty.

First of all, we should note that such a question is intelligible only with reference to the *next subdivision of the broken period*: that is, in this case the meaning of the question is, how many days are there from a particular hour on Friday to the same hour on Tuesday. This makes the answer quite certain. From 6 a.m. on Friday to 6 a.m. on Tuesday following, there are 4 days: and the proper way to answer the question is to convert Friday and Tuesday into week-day figures 6 and 3, and to add a whole period (7) to 3 before deducting 6. Thus 7+3=10; from 10 take 6, and we have the answer, 4 days. Some exercise is necessary in order to do even these simple week-day problems correctly.

The rule about *adding a whole period* when we have to reckon from a fraction of one period to a fraction of the next is very important. How many days are there from 23rd October in one year to 15th March in the next, the second being a leap year? If we refer to the Eye-table **q** we shall find that 23rd October is the 206th day from 1st April; and 15th March (where we have had to pass 29th February) is the 350th day. Deduct 206 from 350. Answer, 144 days.

To take another case, suppose we are required to deduct the longitude of Jupiter from the longitude of the sun, it being given that the former is 300 degrees and the latter 29 degrees. To answer this question we must first add 360 degrees (the whole period in this case) to 29, and then from the total 389 subtract 300; answer, 89 degrees.

If the 1st of a Tamil month be the 15th July, what will be the 7th of the Tamil month? In such cases we must *make the same addition to or the same deduction from the one side as we make in regard to the other.* In the example before us, the addition to be made is 6, and the answer, 21st July.

If the 1st of Tamil month be the 15th July, what will be the 29th of the Tamil month? We add 28 to each side. Therefore the answer is 15+28=43rd July, from which we deduct the whole of the completed period (July=) 31 days. Final answer, 43 *minus* 31=12th August.

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* The Nakshatras were primarily certain constellations serving as permanent land marks in the ecliptic but in later Indian Astronomy they have come to mean certain fixed measures of space (generally 13⅓ degrees) in the ecliptic.

CHAPTER II.—EXPOSITION OF THE EYE-TABLES.

THE WHOLE SYSTEM OF COMPUTATION EXPOUNDED BY MEANS OF THE EYE-TABLE.

33. The student desirous of acquiring the ability to compute with exactitude any tithi, nakshatra, yoga or vāra will find *all* the material necessary for him in the Eye-table of the particular siddhānta which he wishes to study, whether Sūrya, first Ārya, Brahma, or Śirōmaṇi. The first six pages of each Eye-table 153 to 170, contain all that is necessary for obtaining any of these results correct to two places of decimals, while pages 171 to 194 give expanded tables of equations which will enable the student to obtain results correct to four places of decimals, viz., down to *palas* in the Indian scale of time; illustrative examples are also prefixed to each Eye-table. For the reason stated in paragraph 198 below, no separate Eye-table is necessary for the second Ārya siddhānta.

34. It will be seen that each Eye-table is divided into 26 parts, **a** to **Z**, lettered serially in the margin of the table (**Z**, however, stands first, as explained below, for a mnemonical reason), and the following explanation adheres to this order. To facilitate reference, a loose copy of the principal Eye-table, that of the Sūrya siddhānta is supplied with this work.

EYE-TABLE, SECTION Z.—*The signs of the zodiac.*

35. This section which is placed at the head of each Eye-table does not contain any calculated tabular matter, and is styled **Z** firstly, to arrest attention, and secondly, because it refers to signs of the *zodiac*.

36. *Order of signs of zodiac or rāśis and longitude of commencement of each sign or rāśi.*—The twelve signs of the zodiac or *rāśis*, whose names are preserved in the Malayalam names of months, were borrowed by the Hindus from a western source, Chaldean or Greek, as is apparent from the procedure of Varāhamihira who names each sign first in Greek (Kriya, Tauro, Jimuthro, Kankri, etc.), and then in Sanskrit (Mesha, Ṛishabha, etc.). The longitudes of the *rāśis* are reckoned in Indian astronomy from a fixed point in the heavens, generally identified as **Z** in *Zēta Piscium*, whereas in European astronomy, the 0° point of longitude is reckoned from the meeting point (which is liable to variation from year to year) of the celestial equator and the ecliptic. In European astronomy this meeting point is conventionally called the first point of Aries, but it is not now in the *constellation* Aries, because every year, owing to the precession of equinoxes, the first point of Aries moves back 50 seconds of an arc along the ecliptic. About A.D. 532 the first point of Aries of European astronomy was identical with the 0° longitude of Indian astronomy, but since then, the former has receded every year, till now there is a difference of 23° between the first point of Aries (European astronomy) and the 0° longitude of Indian astronomy, *vide* paragraph 229 below. For his present purposes, the student need not trouble himself with the difference between the two reckonings of celestial longitude, but he will understand that when, for instance, the planet Jupiter is said to be 15° in *Kanyā*, the meaning is that the longitude of Jupiter is 150° + 15°, or 165°.

37. The Eye-table shows how the solar months receive different names in Bengal, in the Tamil country, and in Malabar, which are the principal tracts of the country (other than Orissa) where solar months are, or have been, ordinarily used.

EYE-TABLE, SECTION a.—*Moment of sankrānti in days of solar year and decimals of a day.*

38. The moment when the sun enters a rāśi, i.e., when his longitude is 0°, 30°, 60°, etc., is called a *sankrānti*, an epoch with which Hindu festivals are often associated. The first sankrānti or Mēsha sankrānti is the most important of all, being the beginning of the Indian solar year. In the European calendar

the year begins at midnight between the 31st December and the 1st January, and each month has a fixed number of days, 31 or 30 or 29 or 28 as the case may be. The Indian solar year may begin at any moment of the day. This moment, to five places of decimals, is given for each century year in section **k** of each Eye-table and it is given for every A.D. year in Table II, pp. 184 to 263. In the same manner each month may begin at any moment of the day and the duration of a month cannot be expressed as a whole number of days, but can only be stated as so many days and a fraction, which is given in section **a** of the Eye-table. Nor is this all. The actual duration of a month under each siddhānta varies, theoretically, according to the epoch: for instance the duration of Mesha month was not the same under the Sūrya siddhānta in A.D. 500 as it is now. For each epoch the duration has to be calculated according to a method which is explained in Chapter IV below, page 83. Still the variation, even over a period of 2,000 years, is not very material and we generally apply to the whole period the durations of months calculated for a particular epoch. The durations of months given in the Sūrya siddhānta Eye-table were calculated by the late Sankara Balakrishna Dikshit for the epoch A.D. 1137 and have been verified by the present writer for A.D. 1165 as shown in Chapter IV, paragraph 201. The durations of the months according to Brahma siddhānta are different from those according to Siddhānta Śirōmaṇi, because the sōdhyas in the two siddhāntas are different.

EYE-TABLE, SECTION **a**—*continued.* *English date corresponding to each sankrānti A.D.* 1900.

39. Under this heading the Eye-table gives the correspondence of the sankrāntis, according to each siddhānta, to the days of English months. Thus it is stated in the Eye-table that the Mēsha sankrānti in the year 1900 A.D. corresponded, according to the Brahma siddhānta and the Siddhānta Śirōmaṇi, to April 11, and according to the Sūrya siddhānta and the Ārya siddhānta to April 12. Similar differences will be found between the two sets of siddhāntas in the remaining months of the year 1900. If the reader runs his eye down column **k** in the Eye-table, he will find that, whereas in A.D. 400 the Mēsha sankrānti, or commencement of the Indian solar year, according to the Brahma siddhānta as well as the Siddhānta Śirōmaṇi, fell on March 16, the same sankrānti in the year 1700 A.D., even before the application of the Gregorian reform of the calendar began to affect the variations between the Indian and the European calendar, fell on March 27, a difference of 11 days for 1,300 years. This is a result of the Indian calendar being regulated, not by the tropical year, like the European calendar, but by the sidereal year. The exact equivalent in English month and day, of any particular sankrānti according to any particular siddhānta can be calculated in the least possible time by means of the Eye-table, as shown in the illustrative examples, but the present intimation in Section **a** of the Eye-table is merely intended to show how in practice the beginnings of Indian solar months run in relation to the beginnings of European calendar months.

EYE-TABLE, SECTION **a**—*continued.* *Lunar month; each month commences before the sankrānti noted in next column.*

40. This line of the Eye-table gives the names of the 12 lunar months, Chaitra, Vaiśākha, Jyēshṭha, etc. Except in Southern India and in Bengal, the ordinary civil reckoning over the whole of the Indian continent is by lunar months; and even in the excepted provinces, the calculation of days according to the lunar month has to be made much more often than the reckoning according to solar months. To understand the lunar reckoning in all its details is to understand in its entirety the Indian calendar system. Not very much by way of a detailed explanation of the lunar month can be attempted in this place, but it is necessary to note one or two points that are indispensable to a proper understanding of the subject at this stage. The first point is, that in the ordinary scheme of 12 solar and 12 lunar months in a year, *each lunar month is regarded as commencing before the date on which a particular solar month begins and receives*

its name from that circumstance. For instance, the lunar month called Chaitra must occur within 29·53 days before the Mēsha sankrānti, or the commencement of Mēsha solar month; the lunar month Vaiśākha *must* occur within the same interval of 29·53 days before the Ṛishabha sankrānti, or commencement of the Ṛishabha solar month: and passing to a later month, the 7th lunar month Kārttika must occur within an interval of 29·53 days before the Vṛischika sankrānti, or commencement of the Vṛiśchika solar month. Now the ordinary interval between any solar sankrānti and the next is 30 or 31 days as in the European calendar, but the ordinary interval between the commencement of a lunar month and the commencement of the next lunar month is only 29·53 days; so that it must sometimes happen that more than one lunar month commences in the interval between two solar sankrāntis or, which is the same thing, between the commencements of two solar months. Following the principle first laid down, in the words italicized above, both the lunar months occurring in such a case in the interval between two solar sankrāntis receive the same name, the first being called *adhika* or intercalary, and the second *nija*, or true. Intercalary lunar months are to be found in many calendars other than the Indian, but the Indian calendar has for many centuries rigorously enforced the principle stated above in determining the naming of intercalary or *adhika* lunar months. As an *adhika* lunar month is of frequent occurrence, seven such months being due in the course of 19 years, it follows that the solar month, which is ordinarily an item neglected in civil reckoning over the greater part of India, is nevertheless indispensable in order to ascertain whether there will be an *adhika* month in a particular year. And since the intervals between the same solar months are not the same according to the different siddhāntas, it also follows that when there is an *adhika* month according to one siddhānta, there may not be an *adhika* month under another siddhānta. In the list of lunar months furnished in the section of the Eye-table now under consideration, No. 13 Chaitra is shown as a recurring month, but this is simply given as an example and, in practice, any lunar month may in turn be an *adhika* or intercalated month.

EYE-TABLE, SECTION b.—*Increase in days* (1) *of lunar month, and* (2) *of sun's anomaly.*

41. This line of the Eye-table merely gives multiples from 1 to 13 of 29·5306 days for each lunar month. The use of this line will be understood when we come to calculate the sun's anomaly at a particular moment (paragraph 54, page 17 below).

EYE-TABLE, SECTION c.—*Increase of moon's anomaly when the interval between Mēsha sankrānti and the first new moon in the solar year is* 0·00 *day.*

42. The length of the synodical month, or the interval between one new moon and the next is 29·5306 days, whereas the length of the moon's anomalistic month or the month which determines the irregularities in the moon's motions, is 27·5546 days. The difference between these two periods is 1·976 days and this difference increases from month to month. The moon's anomaly at the commencement of each solar year is obtained by adding the quantities in sections m and p of the Eye-table. This anomaly is then increased by the interval between the commencement of the solar year and the first new moon in the solar year, for which purpose we add the quantities in sections l and o in the Eye-table as shown in the illustrative examples. We have now got to the moon's anomaly at the first new moon in a solar year. If to this quantity we add one of the quantities in section c of the Eye-table, we get the moon's anomaly at the commencement of the various lunar months in a given year. Section c of the Eye-table is, therefore, an important datum for calculating the lunar anomaly, and we shall duly make use of it for that purpose later on page 17.

EYE-TABLE, SECTION d.—*Tithi equivalent in days.*

43. In the Indian calendar system the days are ordinarily reckoned, not from midnight to midnight as in the European calendar, but from sunrise to sunrise;

and further, the lunar month of 29·53 days is divided into 30 tithis, so that each tithi is not exactly one day, but ·9843 of a day. A tithi may end at any part of a day and in theory, in order to know what is the tithi at any moment of the day, it is necessary also to know what tithi came to an end that day and when it came to an end, and what tithi is running at the moment in question. In practice, however, and for most purposes of civil reckoning, the tithi for a day is fixed by that tithi which was current at sunrise of that day and no account is taken of any other tithi that may commence during the day, except for astrological purposes. But the complications connected with tithis do not end here. It has already been observed that the Indian calendar takes account not only of mean periods of time which, properly speaking, should be the sole basis of civil reckoning and which, in all probability, did exclusively govern the Indian calendar in ancient times, but also of the *actual* ending moment of a tithi, a month, a year and so on. This minute concern about actual ending moments is peculiar to the Indian calendar and necessitates constant reference to a panchānga or Ephemeris in which the ending moments have been previously calculated.

44. The ending moment of a tithi is the moment at which the moon is removed from the sun by an exact multiple of 12 degrees. The moment when the moon is exactly 12 degrees distant from the sun, called in European astronomy an elongation of 12 degrees, is the ending moment of the first tithi; similarly the second tithi ends when the moon is exactly 24 degrees from the sun, and full moon is the moment when the moon is 180 degrees from the sun, i.e., when it is exactly opposite to the sun in the heavens. The determination of the moment when the moon is in each of these several positions is a tedious astronomical process which, in modern astronomy, can be accomplished only by means of a nautical almanac; nautical almanacs are in fact being used extensively by Indian panchāngam-makers of the present day who follow the so-called Drig-ganita system which, however, is no system at all of *Indian* astronomy, but is a conventional name for a system based on a European or American nautical almanac. The exact *modern* astronomical process for determining a tithi would require the employment of quite a large number of equations, some of them very minute and very complicated in character; but the Indian calendar has for a long time used for the determination of tithis only two equations, viz., one depending on the moon's anomaly and the other on the sun's anomaly. Both these equations are also used for yogas, and one of them, the moon's equation, is used for nakshatras. Similar equations, called the annual parallax and the anomalistic equation, are used to determine the exact position of planets in Indian astronomy (Table IV).

EYE-TABLE, SECTIONS e, f, g.—*Moon's equation of the centre and moon's anomaly in days and decimals of a day.*

45. In these portions of the Eye-table we are confronted directly with the equations of the moon last mentioned. These equations are expressed to two decimal places from ·00 to ·41 in the case of tithis; from ·00 to ·38 in the case of nakshatras; and from ·00 to ·35 in the case of yogas. If these equations were carried to four places of decimals, as they must be when we wish to ascertain the ending moments of tithis, nakshatras and yogas in palas as well as ghaṭikas, we would need much more extended tables, which are given in a later portion of the Eye-table (pages 171 to 194 below). For practical purposes, even of accurate calculation, in Indian epigraphy and in Indian history, we do not need to use more than two places of decimals of a day, and that is why the Ephemeris gives the ending moments of tithis and nakshatras to two decimal places.

46. In order to know what equation to apply towards the determination of the ending moment of a particular tithi, nakshatra, or yoga, we must know the anomaly of the moon at that moment. The anomaly of the moon is first of all given for the commencement of each solar year (vide sections m and p of the Eye-table) and to this quantity we add the successive periods of time which will bring us to any given moment in the year for which we wish to know the tithi, nakshatra, or yoga. In other methods for the verification of the Indian calendar, it is usual to express the anomaly of the moon or of the sun as so

many degrees from perigee or apogee. In order to simplify calculation, however, all anomalies are expressed in the present work in days and fractions of a day 360 degrees being equal to one anomalistic month of 27·5545 days in the case of the moon, and one anomalistic year of 365·26 days in the case of the sun. The reckoning of the anomalies in the present work is always from perigee. The anomaly of the moon at any given moment having been ascertained in days, we have to find from sections **e**, **f** or **g**, of the Eye-table the corresponding equation, with its appropriate sign, and apply it according to the rules given in the illustrative examples.

EYE-TABLE, SECTIONS **h, i**.—*Sun's equation of the centre and sun's anomaly in days of the solar year, for tithis and yogas.*

47. For tithis and for yogas we require the sun's equation as well as the moon's, and sections **h** and **i** of the Eye-table give us these equations. As the sun's equation does not vary, except in the third place of decimals, for a whole day, the anomalies at pages 154, 160, 166 are given generally in whole days of the year, except where the equation is at a minimum or at a maximum, in which case the exact fraction of the day for which the minimum or maximum is appropriate is also indicated. In the extended anomaly and equation tables which are printed at pages 177, 178, 185, 186, 193 and 194 below, sun's anomalies are given to two places of decimals of a day, and sun's equations to four places of decimals of a day.

48. The 0 day of the sun's anomaly is properly speaking the day and moment of the day in a year when the sun is at perigee exactly (Special Sun-Table I, page 78 below, cols. 6, 12 and 18). Now the sun's anomalistic position on any given day of the year is practically the same, whatever year may be under consideration, and therefore, the sun's equation tables in the present work merely give for each day of the solar year the corresponding equation, viz., the equation of the anomaly corresponding to the day. In the Ārya siddhānta this assumption is quite correct; in the Sūrya siddhānta it is very nearly correct; but in the Brahma siddhānta and the Siddhānta Śirōmaṇi, while the table of anomalies and equations is the same, a correction in the number of days of the sun's anomaly has occasionally to be made, as indicated in the illustrative examples under the Siddhānta Śirōmaṇi Eye-table. The explanation of these variations belongs properly to a more advanced portion of the present work. (See Chapter IV, paragraphs 189 to 191, page 75 below.)

EYE-TABLE, SECTION **j**.—*Perpetual week-day almanac for the European calendar.*

49. The week-day is the meeting ground of the Indian and European calendars, and whatever date we may be engaged in investigating, it is generally useful, and almost invariably indispensable, to know what was the week-day of that date. This information has to be found as quickly as possible, but at the same time accurately. The Indian method for ascertaining the week-day is the primitive one of dividing by 7 the ahargaṇa or number of days which have elapsed since 0 Kaliyuga. Many good methods have been designed and published in modern times for ascertaining week-days, and Eye-table **j** has been selected as being the best of them. It consists in the addition of four figures, viz. (1) a constant for the century, (2) a constant for the odd years in a century, (3) a constant for the month, and (4) the day of the month. The example given in section j of the Eye-table, viz., "Find the week-day of 26th January 1844" will illustrate the ordinary use of this perpetual almanac for A.D. years. For a B.C. year, e.g., the 15th of March 44 B.C., since B.C. years are reckoned backwards, we must first of all turn the B.C. year into the forward year of a particular century. In this case 44 B.C. is the 57th year of the century beginning with 101 B.C. [Centuries B.C. always begin with 101, 201, 301, etc., and not with 100, 200, 300, etc.] Then we proceed to find the constant for the century 101 B.C. which is 0. and add the constant for the year 57, for March, and lastly 15, i.e., $1 + 2 + 15 = 18$. This, divided by 7, leaves as remainder 4, so that we know that the week-day of 15th March 44 B.C. was a Wednesday.

50. An important warning has, however, to be given in regard to week-days in B.C. years. So far as is at present known, the only people who observed week-days in B.C. years were (1) the Assyrians, Babylonians and Egyptians whose week-days do not, however, figure in any known history, (2) the Chaldeans who practised astrology in the Grecian and Roman States and (3) the Jews who appear at a very early time to have borrowed the week-day reckoning from the Chaldean peoples with whom they were associated. The Romans and Greeks, throughout the period of the classical literature which has come down to us, do not seem to have had any practical knowledge of the week-day, except that they knew that the Sabbath or seventh day of the week was a day of rest among the Jews. One solitary* reference to a planetary week-day, and that by the Latin poet Tibullus who was a student of astrology, is all the evidence that occurs in any context showing that the Romans of the first century A.D. possessed an acquaintance with week-days. The Romans as a rule observed the *nundinae* or every 9th day as a market day, and their month was divided into three unequal portions by the Kalends, Nones and Ides. At what epoch the Hindus became acquainted with the week-day is an interesting but obscure point; but since it came to them from a Graeco-Roman source, during Christian times, and subsequent to Ptolemy's date (middle of second century A.D.), as we know from Indian inscriptions and other early references to the week-day in Indian literature, and also from the very few week-days which have come to light in Indian inscriptions and records between the fifth and eighth centuries A.D., we may presume that the week-day was not in common use in India before the eighth century A.D. and not at all in use before the fifth century A.D. In the rather keen controversy on this subject, which is one of constant recurrence in Indian journals and newspapers, it is of importance to bear in mind that, while the original planetary week-day was an instrument of Chaldean astrology and as such known to Greek and Roman *students of astrology in the century preceding the Christian era*, the practical use of the week-day for civil reckoning was probably due to the exigencies of early Christian usage, which found in the week-day a convenient means of naming several important days in the Christian liturgical year, such as Holy Thursday, Good Friday, Holy Saturday and Easter Sunday. The earliest references to the week-day, as an item of *civil* reckoning, are, in fact, to be found in a well-known passage of the Christian Apologist and Martyr, St. Justin, in the first quarter of the second century A.D. We next find the week-day mentioned, as an institution currently familiar, but of recent origin, by Dio Cassius, a Greek historian of the early Roman Empire, about A.D. 225. Dio Cassius also gives an explanation of the order of week-days, which is identical with the explanation given by the Indian astronomer Varāhamihira. By the time of Constantine the Great (beginning of the fourth century A.D.) we find the week-day in common use in the Roman Empire for describing Christian feasts and festivals. This was precisely the epoch at which the Guptas were in power in India, the epoch at which Greek ideas of astronomy, mathematics and medicine flowed freely into India, and the epoch probably at which the week-day began for the first time to make its appearance in India. Between the time, however, of the first appearance of an idea like that of the week-day in any country and its coming into general use, there was bound to be a fairly long interval of possibly two or three centuries ; and we may note that so late as the tenth and eleventh centuries A.D., inscriptions in Ceylon are still wanting in week-days. The practical conclusion to be drawn from these various data is that it is vain to look for an allusion to a week-day in any literature, Eastern or Western, in any century B.C. and that any alleged find of such an allusion must be examined very critically: It is characteristic that the very first reference in any history, sacred or profane, in which the week-day

* Dr. J. N. Farquhar, Editor of the "Religious Life of India" and other series, has drawn the author's attention to a *graffito* or writing on a wall, discovered in the remains of Pompeii (which was buried on 24th August A.D. 79 by a volcanic eruption), and quoted in *Schiaparelli's Astronomy in the Old Testament* (1905), p. 186. The *graffito* is supposed to have been the work of a Roman slave and consists of six lines scratched in the following order : *Saturni, Solis, Lunae, Martis, Iovis, Veneris* ; each line consisting of the name of a week-day in Latin. The omission of [Dies] *Mercurii* (Wednesday) in this enumeration is curious. The writer may have been one of the students of astrology who, as presumed in the text *supra*, were acquainted with week-days in the first century A.D. and he may have written down the week-days on a wall to assist his memory, and at the same time failed to recall one day. The discovery shows that week-days *were* known in the third quarter of the first century A.D., but it by no means proves that the week-day was then used as an item of *civil* reckoning of time. The place assigned to *Dies Saturni*, following the Chaldean order, is significant and points presumably to the astrological character of the *graffito*.

has played a part in chronological investigation, is in connexion with the exact date of the Last Supper and the Crucifixion of Christ. By means of the week-days, occurring in the Gospel narratives of the New Testament, we know that these events must have happened in one of three years, A.D. 29, A.D. 30, or A.D. 33, although it will always remain a disputed point in which of the three years these events happened. *Encycl. Brit.*, 11*th edition*, *Art.*, "*Bible Chronology, New Testament.*"

51. A *Nota Bene* in section **j** of the Eye-table draws attention to the dates when the Old Style of reckoning ceased in the different parts of Europe, as well as to the date, 14th September 1752, when the New Style was adopted by Act of Parliament in the United Kingdom.

EYE-TABLE, SECTIONS k, l, m, n, o, p.

52. These sections of the Eye-table furnish three items of information which must form the first step in any Indian chronological reckoning according to the author's method. For any such reckoning we want to know (1) the exact moment when a solar year commenced, for which purpose we consult section **k**, adding to a figure in that section a quantity in section **n** when necessary; (2) the exact moment of the first new moon in the particular solar year with which we are concerned; this is given in section **l** of the Eye-table, to which we add, when necessary, a quantity in section **o**, deducting again, when necessary, once or twice 29·5306 days; (3) the moon's anomaly at the commencement of the solar year, as given in section **m**, to which a quantity from section **p** should be added for odd years in a century." In applying sections **m** and **p**, however, it should be remembered that the moon's anomaly, to be at all useful, must also be reckoned up to the first new moon in the solar year, for which purpose the quantities in sections **l**, **o**, **m** and **p** should be added together. Just as sections **k**, **l** and **m** give certain information for the first year in a century, sections **n**, **o** and **p** give the same information for all the odd years of a century.

A PRACTICAL ILLUSTRATION OF THE EYE-TABLE.

53. This is a convenient stage at which we may introduce a simple example illustrating the most usual processes of reckoning in the Indian calendar. The earliest example, so far as is now known, of a well-authenticated week-day in Indian inscriptions is the Eran Pillar Gupta Inscription, which quotes "Thursday" as the week-day of the "12th tithi in the bright half of the lunar month of Āshāḍha" in a year corresponding to A.D. 484. We shall now show how the Eye-table, studied thus far, enables us to calculate the exact English equivalent of this date and also to verify the fact that it was a Thursday. We make the calculation according to the Sūrya siddhānta Eye-table which in all probability was the siddhānta (in an early form) that was used in the actual reckoning recorded in the inscription. The reader will save himself a good deal of future trouble by carrying out carefully the processes indicated below. Section **k** of the Eye-table tells us that in A.D. 400 the solar year commenced on March 17 ·48569. Section **n** further shows that for 84 odd years of the century the fraction to be added for determining the commencement of the solar year is ·73554. We know, therefore, that in the year A.D. 484 the Indian solar year commenced, according to the Sūrya siddhānta, on March 17·48569 + ·73554 = March 18·22123. Similarly, sections **l** and **o** tell us that in the year A.D. 400 the first new moon in the solar year was removed from the commencement of the year by 23·84466 days; to which we add, from section **o**, the interval of the first new moon in the solar year corresponding to 84 years which is 0·54533 of a day. The two quantities being added, we infer that in A.D. 484 the interval between the commencement of the solar year and the first new moon in the same solar year was 23·84466 + 0·54533 = 24·38999 days. The same process, performed with the aid of sections **m** and **p**, informs us that in the year 484 A.D. the moon's anomaly at the commencement of the solar year was 21·75228 + 13·46585 = 45·21813 days. Consequently the moon's anomaly at the first new moon in the same solar year must have been 45·21813 + 24·38999 = 59·60812 days. Subtracting from this, two full anomalistic months (Eye-table **d**) 55·1092 days, we have, as the age of the moon's anomaly at the first new moon in the solar year A.D. 484, 4·499 days.

54. We have now to carry on these reckonings to the 12th tithi of Āshāḍha month, for which purpose we have to add (1) 59·0612 days according to section **b** of the Eye-table for Āshāḍha month, (2) 11·8122 days for the ending moment of the 12th tithi according to section **d** of the Eye-table, and (3) 3·952 days (section **c** of the Eye-table) *plus* 11·8122 days for the increase of the moon's anomaly from first new moon in the solar year to the 12th tithi in Āshāḍha month. The English equivalent of the date of the mean tithi we are in search of is given by March 18·22123 (the commencement of the Indian solar year A.D. 484–85—sections **k** and **n**) *plus* 24·38999 days (interval between commencement of solar year and first new moon in solar year—sections **l** and **o**) *plus* 70·8734 days (interval between first new moon in solar year and 12th tithi of bright half of Āshāḍha month—sections **b** and **d**) = March 113·4846, which by section **q** of the Eye-table is equal to ·4846 day on June 21 A.D. 484. The sun's anomaly at the ending moment of the mean tithi that we are in search of is given by 24·3899 days (interval between the commencement of the solar year and first new moon—columns **l** and **o**) *plus* 70·8734 days (interval between first new moon in solar year and end of 12th tithi of bright half of Āshāḍha month—section **y** or sections **b** and **d**) = 95·2633 days. According to the extended (four decimal places) sun's anomaly table in the Sūrya siddhānta Eye-table, section **h** (p. 177), the equation for a sun's anomaly of 95·26 days is —·0454 day. The moon's anomaly at the mean ending moment of the 12th tithi of the bright fortnight of Āshāḍha month is given by 4·499 days (the quantity already arrived at for the moon's anomaly at the first new moon in the solar year according to sections **l**, **m**, **o** and **p**), *plus* 15·764 days (the increase of moon's anomaly up to Āshāḍha śukla or bright fortnight, 12th tithi—columns **c** and **d** of Eye-table) = 20·263 days. Before using this moon's anomaly we have to add to it algebraically the sun's equation already arrived at for the day in question, viz., —·0454 day, and we obtain, as the net moon's anomaly for the given moment, 20·218 days. With this result we go into the moon's anomaly and equation table (four places of decimals) in the Sūrya siddhānta Eye-table, section **e** (p. 172), and find that the moon's equation for 20·218 days is +·4138 day. We now add algebraically the sun's and moon's equations obtained from the anomaly tables, viz., —·0454 day + ·4138 day, to the ending moment of the mean tithi in English time already arrived at, viz., March 113·4·46. The net result is March 113·4846 + ·4138 — ·0454 = March 113·8530. We know from section **q** of the Eye-table that March 93 is equal to June 1, so that March 113 is equal to June 21. We know also from section **r** of the Eye-table that ·8500 of a day is equal to 51 ghaṭikas and ·0030 of a day is equal to 11 palas; so that ·8530 of a day is equal to 51 ghaṭikas and 11 palas. According to section **j** of the Eye-table, the week-day of June 21, A.D. 484, is given by the formula (2 + 0 + 3 + 21 =) 26 ÷ 7; the remainder in this division being 5, we know that the week-day was the 5th day of the week, or Thursday. We conclude that the ending moment of the 12th tithi of the bright fortnight of lunar Āshāḍha month in the year A.D. 484–85, referred to in the Eran Pillar Inscription, was Thursday, 21st June A.D. 484, 51 ghaṭikas and 11 palas after mean sunrise. The week-day is found to be correct and we know the exact English month and date corresponding to the tithi in question. All these processes may be shortened a good deal when the student is familiar with the different portions of the Eye-table, but the example, thus given in detail, will satisfy him that it is possible, without any high mathematical powers, to arrive at the absolute ending moment of a tithi, correct to four places of decimals, with the aid of the Eye-table only. It may be noted, also, that the ending moment of this particular tithi, according to the different siddhāntas, has been worked out most carefully by an eminent Indian authority, the late Mr. Sankara Balakrishna Dikshit in the Introduction to Dr. J. F. Fleet's *Gupta Inscriptions* (p. 157), and the result above arrived at is exactly that reached by Mr. Dikshit at the end of a much longer process which he has only partially indicated, whereas by the present method the student is able to reach the same result finally by a known method of simple calculation. Mr. Dikshit also calculated the ending moment of the same tithi according to other siddhāntas and his results given below may be verified by the student according

to the different Eye-tables furnished in this work. They will be fully expounded in Chapter IV of this work (paragraphs 208 and 209, page 87 below).

Ending Moments of the 12th tithi, bright fortnight of Āshāḍha in A.D. 484–85—

(1) Sūrya siddhānta: A.D. 484 June 21, 51 ghaṭikas 11 palas after mean sunrise.

(2) First Ārya siddhānta: A.D. 484, June 21, 49 ghaṭikas 48 palas after mean sunrise.

(3) Brahma siddhānta: A.D. 484, June 21, 50 ghaṭikas 15 palas after mean sunrise.

(4) Siddhānta Śirōmaṇi: A.D. 484, June 21, 53 ghaṭikas 21 palas after mean sunrise.

EYE-TABLE, SECTION **q**.—*Days counted from March* 1 *and days counted from April* 1.

55. The reader who has attentively followed the explanation of sections **k**, **l**, **m**, **n**, **o**, **p**, and the illustrations given thereunder will have seen the practical use of section **q** of the Eye-table. In arriving at the English equivalent of any Indian date, we have to count days from the commencement of the solar year. Running the eye down section **k** of any of the Eye-tables, the reader will notice that, while at the beginning of Kaliyuga the Indian solar year began on the 15th of February, by the time we come to A.D. 400, which is practically the earliest date that can possibly be verified according to the details of the Indian calendar, the Indian solar year now (i.e., in A.D. 400) commences on (1) 17th March, according to the Sūrya and Ārya siddhāntas and (2) 16th March, according to the Brahma Siddhānta and Siddhānta Śirōmaṇi. The commencement of the Indian solar year is then retarded at the rate of one day for every century until 1752, when the introduction of the New Style into the British calendar carries forward the English equivalent by 11 days at once; and from A.D. 1753 forwards, down to our time, the Indian solar year has always commenced in April. Now section **q** of the Eye-table enables us to calculate readily the English month and date corresponding to a certain number of days counted from 1st March or 1st April respectively. Example:—Given that an Indian solar year commenced on the 18th of March and that the ending moment of a particular tithi was 345·5 days from the commencement of the Indian solar year; required to know the English date. Answer:—March 18 +345·5 = March 363·5. By section **q** of the Eye-table, March 338 = February 1; therefore March 363·5 which is 338+25·5 = February 1+25·5 = February 26·5 of the following English calendar year. In reckoning days from April 1, we have to remember that in a leap year April 336 is equal to March 1 of the following year as shown in section **q** of the Eye-table, whereas in an ordinary year April 335 is equal to March 1 of the following year. This means of course that, if there is a leap year in the year following April 1, that is in the next calendar year, then April 336 is equal to March 1 of the following year.

EYE-TABLE, SECTION **r**.—*Ghaṭikas and palas.*

56. This section gives the ghaṭikas and palas corresponding to the decimal parts of a day. The section is so constructed that any decimal part of a day, down to four decimal places, can be interpreted as an exact number of ghaṭikas and palas so as to give the exact equivalent in Indian time. An example of this has already been given by translating ·8530 of a day into ghaṭikas and palas (51 ghaṭikas 11 palas). It should be noted that the division of the day into 24 hours has been known in India only since the introduction of the Greek (Ptolemaic) system of astronomy and astrology, that is, since about the 5th century A.D. and that Indian time is always expressed sexagesimally, i.e., in ghaṭikas, each ghaṭika being the sixtieth part of a day, and palas, each pala being the sixtieth part of a ghaṭika. The occurrence of an allusion to "hora" either as a lagna or as the 24th part of a day furnishes, as was noted by the late Dr. Burgess in his contribution to the *Journal of the Royal Asiatic Society* (1893), intrinsic evidence that the work must be subsequent to the introduction of the Ptolemaic astronomy into India. A practical application of this observation is furnished by

the reference to the *hora* in the text of the ancient Tamil Grammar, the *Tolkāppiyam, Poruladikāram, Kaḷaviyal*, verse 135.

மறைந்த வொழுக்கத் தோரையு ஞாஞ்
சுறந்த வொழுக்கங் கிழவோர்க்கில்லை.

Translation.

"In *Kaḷaviyal*, i.e., the pre-Āryan marriage rule, the man is not obliged to abstain during prescribed days and hours or lagnas (as in the Āryan rule)."

The occurrence of an allusion to the *hora* in this text shows that notwithstanding all that has been stated to the contrary, this part of the *Tolkāppiyam* could not have been composed much before the sixth century A.D.

Table VI in this work may be referred to when the reader wishes to convert any fraction of day, without loss of time, either into ghaṭikas and palas or into hours, minutes and seconds, and *vice versa*.

EYE-TABLE, SECTIONS **s, t, u**.—*Nakshatras.*

57. These sections of the Eye-table give all the information that is necessary, in addition to what has been set out already, to enable us to calculate the ending moments of nakshatras. The scheme of nakshatras is different in the Sūrya and Ārya siddhāntas from what it is by the Brahma siddhānta and Siddhānta Śirōmaṇi. In the two former siddhāntas the nakshatras have equal spaces of 13 degrees 20 minutes each, whereas in the Brahma siddhānta and Siddhānta Śirōmaṇi the nakshatra intervals are either one day, or half a day, or one and a half days, and in one case (Abhijit) one-third of a day. But the principle by which the ending moments of nakshatras are calculated is the same under all the siddhāntas; that is, each nakshatra is normally attendant on a particular tithi, and the ending moment of a nakshatra cannot be separated from the ending moment of the tithi on which it is attendant by more than a certain maximum interval. Accordingly, in section **s** of the Eye-table, under each lunar month, are given the shortest intervals between the new moon of that month and the ending moments of the various nakshatras belonging to that month. What the actual interval will be in a given year will depend on the use we make of sections **t** and **u** of the Eye-table. There is a fixed relation between the distance of the first new moon in the solar year from the commencement of that year and the interval by which the ending moment of any nakshatra during that year can be prolonged beyond the normal moment of occurrence of the nakshatra shown in section **s** of the Eye-table. In the year A.D. 1921–22 the first new moon in the solar year was 24·23 days distant from the commencement of the solar year. Supposing we want the mean ending moment at which nakshatra Uttara Phālguṇi (No. 12 nakshatra) ended in Phālguṇa month in the year 1921–22; section **t** of the Eye-table tells us that when the first new moon is 24 days distant from the commencement of the solar year, the nakshatra intervals throughout the year are prolonged by 0·41 day. Section **u** of the same table tells us that for ·23 of a day *added* to the 24 days we should *subtract* ·02 of a day from 0·41, that is for this particular year the nakshatra intervals shown in table **s** were all prolonged by 0·39 day. Consequently the ending moment of Uttara Phālguṇi nakshatra in Phālguṇa month A.D. 1921–22, which, according to table **s**, should occur 15·33 days after the new moon beginning Phālguṇa month, occurred in the year 1921–22 after an interval of 15·33 + 0·39 = 15·72 days from the new moon beginning Phālguṇa month. From Table II of this work, p. 276, we know that the new moon beginning Phālguṇa month in the year 1921–22 occurred on Sunday, February 26·59; so that the nakshatra Uttara Phālguṇi in that month ended on February 26·59 + 15·72 = February 42·31 = March 14·31, A.D. 1922. This was the ending moment of the *mean* nakshatra according to Sūrya siddhānta. If we wish to know the *actual* ending moment of the nakshatra, the easiest method is to ascertain the anomaly of the moon corresponding to 15·72 days from the new moon beginning Phālguṇa month. The nakshatra equation of the moon's anomaly of this moment is given by the appropriate table of nakshatra equations of the moon in the Eye-table,

section f, pp. 157, 158. The exact process of arriving at the actual ending moment of a nakshatra is not given here because it will be generally found advisable to use the abridged process which is indicated in the illustrative examples under each Eye-table.

EYE-TABLE, SECTIONS V, W *and* X.—*Shortest interval in days from new moon to ending moment of each yoga.*

58. This is the last portion of the Eye-table proper and shows how the ending moment of a *yoga* is to be calculated. The principle is the same as for nakshatras, i.e., there is a normal moment of occurrence for each yoga, determined with reference to the new moon which commences each lunar month; to this normal moment of occurrence we have to add the period of retardation determined by sections W and X of the Eye-table—only the retardations are longer in the case of yogas than in the case of nakshatras, the maximum being 4·11 days under yogas against a maximum of 2·21 days under nakshatras.

The *yoga* is not a very important element for the purposes of the epigraphist and the chronologist. The references to it in inscriptions and literary records are not many and are confined to the later centuries for which we generally have other means of verification in Vikrama and Śaka years. The yoga itself is an artificial conception in Indian astronomy, a yoga being supposed to be the joint space which would be travelled by the sun and the moon in a given period of time, supposing that these bodies travelled in opposite directions instead of, as they actually do, in the same direction. Consequently, just as the tithi or the natural elongation of the moon is the difference between the positions attained by the moon and sun at a given moment in the heavens, the yoga or the artificial combination of the two motions is the fictitious space which would be described by the sun and the moon if they were travelling from new moon to new moon in opposite directions instead of in the same direction. In the supposed case the sun and the moon together would do the 360 degrees of the ecliptic in 25·42 days, and the length of the yoga month is therefore 25·42 days. These 25·42 days are distributed among 27 yogas just as the nakshatra month of 27·33 days is distributed among 27 nakshatras, and the ending moment of each yoga is determined accordingly. A reference to a yoga in a literary work or an inscription necessarily implies that the framer of the record fixed the position of the yoga with reference to a panchānga, for he could not possibly have found a yoga by reference to the actual position of the sun and the moon in the actual heavens except by a circuitous process of calculation; and hence the investigation of yogas is a matter of altogether secondary importance in historical and chronological research.

EYE-TABLE, SECTION Y.

59. For purposes of reference, since it will be frequently required in connexion with Table II, a section Y is added to each Eye-table, showing (1) the collective duration in days from the first new moon in the solar year up to the ending moment of each tithi in every lunar month, and (2) the increase of the moon's anomaly up to the end of each mean tithi; this increase has to be added to the moon's anomaly at the first new moon in the solar year. It should be remembered, when using this section Y, that an adhika month adds one to the number of lunar months in a year and that for instance in a year in which Āshāḍha is adhika, the collective duration up to the end of a tithi in Bhādrapada month should be looked for under Śrāvaṇa in section Y.

The reader should accustom himself to think of lunar months as well as of nakshatras by their number; and in a year in which No. 4 month is adhika, Śrāvaṇa which is ordinarily No. 5 month will become No. 6 and information regarding tithis and nakshatras in that month should be looked for in sections Y and S under ordinary No. 6 month (Bhādrapada). This is why every month column in the tables of nakshatras and yogas (sections S and V) is headed "ordinarily."

Whether a particular year contains an adhika month and what that month is, can always be readily ascertained from Table II (pp. 200 to 279).

CHAPTER III.—EXPOSITION OF THE ELEMENTS OF INDIAN CHRONOLOGY.

SECTION i.—*The synodical month and the Indian solar year.*

60. *Astronomical constants.*—A regular treatise on astronomy always closes with a chapter on astronomical constants, viz., those elements of calculation which are of use in predicting astronomical events. A treatise on astronomical computation must begin, not end, with astronomical constants.

61. *First astronomical constant—The moon's synodical month or lunation.*—The first astronomical constant in Hindu astronomy is the moon's synodical month of $29\frac{1}{2}$ days. The exact length of this period, according to the *Sūrya siddhānta*,* is 29·530587946 days. The ancient Hindu astronomers purposely calculated this period to what we should now call nine places of decimals in order that there might be no error even after thousands of years. The period fixed by modern astronomy does not differ from the above in the first six decimal places, and as ·0000008, the actual difference, is $\frac{1}{100}$ of a second, it follows that the difference between European and Indian astronomy in 5,000 years or 61,844 synodical months may amount to 4,260 seconds or a little over 1 hour and 11 minutes. In practice the difference between the European and the Indian computation of new moons is very much less.

62. *What is a synodical month?*—A synodical month or lunation is the interval between one new moon and another. It is not the period in which the moon travels once round the earth, but the period in which the moon gains one complete revolution over the apparent or visible motion of the sun.

The moment of new moon is the moment when sun and moon have the same longitude, i.e., are at the same distance measured from a fixed point in the heavens. When once this moment is past, the moon resumes her journey at the rate of about 13 degrees a day and the sun resumes his at the rate of about one degree a day. It follows that the moon gains twelve degrees over the sun in a day and therefore she gains 360 degrees in about 30 days.

The synodical month, then, is the period during which the moon gains 360 degrees over the sun, and its exact length is 29·530587946 days.

63. *The solar year.*—The next astronomical constant to be noticed in Indian astronomy is the solar year, the length of which, according to the *Sūrya siddhānta*, is 365·258756481 days. The length of the year, according to modern astronomy, is 365·2422408 days. The Julian calendar assumed a year of 365·25 days, i.e., ·00776 of a day in excess of the correct figure. To rectify this error, Pope Gregory XIII in 1582 ordered the dropping out of 10 days and the British Parliament in 1752† similarly dropped out 11 days, and to avoid a recurrence of the error, we now drop out three leap years out of every hundred. The year of 365·2422408 days is, however, a *tropical* year, whereas the Hindu astronomical year is an *anomalistic*‡ year, and we should really compare the Hindu year with the modern *anomalistic* year, which we seldom hear of in practice, but the correct length of which is 365·2596296 days, being an excess of ·001 day over the Hindu year. This no doubt makes a difference of several days in the course of four or five thousand years, but as the Hindu year is essentially lunar and not solar, not much practical inconvenience is caused by the difference.

64. A *tropical* year is that which brings the *seasons* round at the same time of the year, whereas an *anomalistic* year is that which brings back the sun's *anomaly*,

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* The Sūrya siddhānta, the best known system of India astronomy, is believed to have been current in its present form since the eleventh century A.D. and is the standard for all India. Several other siddhāntas are extant, but only one of them, the first Ārya siddhānta, is of any practical importance in Southern India.

† This was the occasion when the NEW STYLE was introduced.

‡ Strictly speaking, a *sidereal* year, but the designation *anomalistic* year is more suitable at this stage in order to lead up to the sun's *anomaly*—for explanation see page 73, paragraph 178.

i.e., the rate at which he moves round the earth. This rate varies according as the sun is near to, or removed from, his perigee, i.e., the point when he is nearest the earth, and once a year the sun returns, as it were, to his old pace. This varying pace of the sun is very important for calculating the moment of new moon, as well as for calculating the moment of sunrise, and this is probably why the Hindu astronomers reckon the course of the sun by the anomalistic, instead of by the tropical, year.

65. *The decursus of the Hindu solar reckoning.*—The Sūrya siddhānta reckoning begins from the midnight between 17th and 18th February 3102 B.C., which is commonly called the beginning of *Kaliyuga*. On the morning of 18th February 3101 B.C., that is one year later, one complete Hindu solar year had run out by 6·13 a.m., i.e., at ·25875 of the day. As however the Hindu day is always reckoned from sunrise, mean sunrise for the whole of India being at 6 a.m., the first year is according to this siddhānta reckoned to have been completed at 13 minutes (or exactly ·00876 of a day) Indian time of the day, on 18th February 3101 B.C. At this moment the year 1 of Hindu chronology began. The Hindus generally reckon completed or expired years, and not current years, as the European calendar does; and the first mean solar year of the Hindu chronology, which began on 18th February 3102 B.C., is, according to Hindu reckoning, the mean solar year 0. By adding 3101 to an English calendar year A.D. we arrive at the corresponding (expired) year of Kaliyuga. Thus the year A.D. 1910 is K.Y. 5011. For a B.C. year, the K.Y. equivalent is obtained by subtracting it from 3102, not 3101.

66. *Correspondence between A.D. and K.Y. years.*—If we reckon 365·258756481 days for every Indian year, commencing from midnight between 17 and 18 February 3102 B.C. we shall find that the commencement of 3101 K.Y. fell on 16th March, 1 B.C., at ·15379 of the day. The Sūrya siddhānta, however, anticipates the commencement of Kaliyuga 3101 by 2·1706944 days because the *true* Indian solar year 0 Kaliyuga really began 2·1707 days before the moment above assigned for its commencement. This correction is called *śodhya*. It thus happens that K.Y. 3101 commenced in 1 B.C. on 13th March at ·9231 of the day after mean sunrise (6 a.m.). From this point table II in this work will carry us on regularly through every year up to A.D. 2000.

SECTION ii.—*Fixing the moment of mean new moon.*

67. At the first moment of K.Y.* 0, according to the Sūrya siddhānta, the sun and moon had the same mean longitude, that is, the moon was *new* at that instant. At the first moment of K.Y. 1, 365·258756481 days would have passed, that is 12 synodical months, and in addition 10·89170112[illegible] days. That is, at the first moment of K.Y. 1, the moon was not new as she was at the first moment of K.Y. 0, but she was 10·89170 days old: and the first mean new moon in K.Y. 1 occurred on 29·530587946 *minus* 10·891701129 days = 18·638886817 days after the commencement of K.Y. 1. In this way in every Hindu year the first mean new moon would occur 18·63889 days later than in the previous year. In the year K.Y. 2 a mean new moon occurred 2×18·63889 days = 37·27778 days later than the commencement of the year, but as this period exceeds a synodical month, the *first* mean new moon in K.Y. 2 really occurred 37·27778 *less* 29·53059, that is, 7·74719 days after the commencement of the year K.Y. 2. The day of occurrence of the first mean new moon for 100 years after 0 K.Y. is given in the Eye-table, section 0 and we see from that table that in 100 K.Y. (mean solar year) the first mean new moon occurred 3·46164 days after the commencement of the year.

68. In 1 B.C., as may be seen from the Sūrya siddhānta Eye-table, section 1, the first mean new moon of the Hindu solar year occurred almost exactly 10 days (properly 10 days less ·0019 of a day) after the commencement of the solar year.

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* i.e., at midnight between 17th and 18th February, 3102 B.C., the moment of commencement of *mean* Indian solar year 0. This moment was, for all purposes, *except one*, the commencement of Kaliyuga according to Sūrya siddhānta; it was also the moment when all the planets, including the sun and moon, were at 0° mean longitude. The *excepted purpose* is the commencement of the *true* Indian solar year, referred to in paragraph 66.

The process of calculating the first new moon in any solar year has been explained in paragraph 53 supra.

SECTION iii.—*Sun's and moon's anomaly and actual moment of new moon.*

69. Although mean new moon occurs every 29·53059 days, the actual new moon does not recur so regularly. About the time when the moon is due to become new, she may be fast, or she may be slow, and we have to take this circumstance into consideration. Hindu astronomers have devised a table of the moon's anomaly which enables us to calculate exactly by how many degrees the moon is in advance of, or behind, her mean position at new moon or at any other time. The ordinary tables of the moon's anomaly and equation of the centre, as these constants are called, will be found in Professor Jacobi's standard article on the subject in Vol. I of the *Epigraphia Indica* and are reproduced in special tables II and III, pages 79 to 81 below. For the sake of practical convenience, the present method converts degrees into time and further calculates the anomaly for each ·001 of the equation, and the result is Eye-table, sections e, f, g.

70. The moon's anomaly (as explained at page 16) is determined for centuries and odd years in the same way as the *mean* moment of the first new moon is determined for every solar year. The moon completes an anomalistic month, that is, returns to a particular pace round the earth in 27·5546 days, and every year the moon's anomaly increases by 365·25875 less $13 \times 27{\cdot}5546 = 7{\cdot}04896$ days. In 100 years the anomaly increases by 16·03078 days.

71. In A.D. 1600, a correction, or *bīja*, introduced by the Hindu astronomer Ganesa Daivajna, came into operation. The effect of this *bīja* is to raise the annual increase of the moon's anomaly from 7·04896 days to 7·04898 days or by two seconds of time every year, and also to diminish the length of the anomalistic month from 27·5546 to 27·55459797 or by ·000002 days, i.e., $\frac{1}{5}$ of a second every month.

72. These figures enable us to calculate the moon's anomaly at any moment, it being assumed by Indian astronomers that at the commencement of the *true* (not mean) Indian solar year Kaliyuga 0, the age of the moon's anomaly, reckoned from perigee, was 4·7797 days by Sūrya siddhānta and first Ārya siddhānta (which is ordinarily referred to in this work as *the* Ārya siddhānta) and 1·9988 days by Brahma siddhānta and Siddhānta Śiromaṇi.

73. Similar remarks apply to the sun, though of course the figures are different. As stated already at page 14, the Indian calendar assumes *in practice* that on a given date of the Indian solar year, the 0 day or the 10th day or the 100th day or the 300th day the sun's anomaly is the same, whatever year we may be dealing with, that is, if the sun's anomalistic equation can be expressed by — ·05 of a day for purposes of tithis at the 100th day of a particular year, the sun will have the same anomaly and the same anomalistic equation for tithis at the 100th day of any other year. This is also the *theory* of the first Ārya siddhānta, which is called *the* Ārya siddhānta in this work; and which lays down that at 0 Kaliyuga, i.e., at the commencement of the *mean* solar year Kaliyuga 0, the position of the sun's apogee was 78° that is, and that this is the case in all years; that is, when the sun has done $\frac{78}{360} \times 365{\cdot}2568$ days or 79·1388 days of his course reckoned from the commencement of the *mean* solar year, or 79·1388+2·1467 days (the addition is the śodhya) from the commencement of the true solar year, he is at apogee, i.e., his anomalistic equation is then 0. Accordingly the Ārya siddhānta Eye-table in the present work states that at 81·29 days of the solar year the sun's anomalistic equation is 0·000: only it converts the subsequent equations into time according to the purpose for which the equation is required, i.e., whether for tithi or for yoga.

74. The other siddhāntas attribute a slow motion to the sun's perigee, that is they do not admit *in theory* that the sun's pace is absolutely the same at the beginning of every Indian solar year, whether mean or true, but that it varies slightly from century to century. These variations are set out in a special table

which will be explained when we come to the construction of tables (page 78 below). In practice, the anomaly tables of the sun presented in sections **g**, **h** and **i** of the Eye-table for each siddhānta are good for at least a thousand years and we have to remember that neither the Brahma siddhānta nor the Siddhānta Śiromani, the only two systems in which the motion of the sun's apogee is at all considerable, had been current for quite a thousand years when we reach the end of the epigraphical period (A.D. 1600).

75. Each anomaly table in the Eye-table, sections **e** to **i** (pages 171 to 194), is divided into four equal portions, two having additive equations and two subtractive. Each equation, as given in the table, consists of three decimal places, the first two being given in vertical columns and the third in a horizontal column. The horizontal column is not necessary when all we want to know is how many hours or how many ghaṭikas after sunrise a new moon or other tithi occurred, or a nakshatra or a yoga ended and consequently, the horizontal place of the equation, namely, its third decimal place, is omitted in the abridged Eye-table, sections **e** to **i**. On the other hand, when such a course is necessary for very accurate work, a *fourth* figure may be added to the third shown in the horizontal column by noting the difference between two successive anomalies and taking a proportional part of the difference between the corresponding equations. Thus, supposing we want the equation for a moon's anomaly of 6·04 days: the anomalies and equations next to those we want are—

☾'s An. 6·031 d.	...	☾'s An. 6·069 d.	...	Diff. ·038 d.
Eqn. −·397 d.	...	Eq. −·398 d.	...	Diff. ·001 d.

The anomaly under consideration 6·04 days = 6·031 + ·009 : the last figure is one-fourth of the difference between 6·031 and 6·069. Therefore the fourth decimal place to be added to the equation —·397 is one-fourth of 10, i.e., 2. Answer —·3972.

We should note that sometimes the *lesser anomaly has the higher equation*. Thus, supposing we require the equation for ☾'s An. 21·46 d. We note the following as the nearest anomalies :—

☾'s An. 21·447 d.	...	☾'s An. 21·485 d.	...	Diff. ·039 d.
Eqn. + ·399 d.	...	Eq. + ·398 d.	...	Diff. 001 d.

Our anomaly is more than 21·447 by ·013, which is one-third of the difference ·039. We therefore *deduct* one-third of 10 or 3 from the fourth decimal place of the equation + ·399 and obtain as the result + ·3987.

The same observations apply to solar anomalies.

76. For ordinary results, we do not require a fourth place in the equation, and we can take the nearest three place equation that we can find in the Eye-table, sections **e** to **i** and thus, by means of a simple sum in addition or subtraction, discover, without a moment's trouble, the actual from the mean moment of a tithi, nakshatra or yoga. Even then we shall be far more accurate than by any of the other rough and ready methods now in use. For stages of the anomaly, both solar and lunar, which increase or decrease very slowly and where the proportional parts are not obvious, the fourth decimal place of the equation is also given in the extended anomaly tables, pages 171 to 194.

Section iv.—*The solar months.*

77. The solar months of the Indian calendar are named in the opening section of the Eye-table. The Tamil names of months are practically the same as the Bengali names, but the first Bengali month *Vaiśākha* gives the name to the second Tamil month and so on, the last Bengali month *Chaitra* being the first Tamil month *Chittirai*.

Also, the Malayalam names of months are generally the same as those of the signs of the zodiac : the first two are called *Mētam* and *Eṭavam* instead of *Mēsham* and *Ṛishabham*.

But whether in the Tamil country or in Malabar or in Bengal, the measure of the solar months is the same. Like the solar year, each solar month ends at a *fraction of the day*, that is, at the moment when the next sankrānti takes place. For purposes of computation, the *sankrānti*, as well as the month to which it gives its name, is reckoned from the very moment at which the previous month ends. But in practice in the Tamil country, when sankrānti takes place after sunset, the next month begins next day; and when the sankrānti occurs before sunset, *that* is the first day of the next month, and the old month loses a day. Other sankrānti rules are observed in other parts of India. (See paragraph 12 *supra*.)

78. The solar months in the Indian calendar, which have 30 days each, are placed at fairly regular intervals, and the months with 31 days each, as also those with 29 days each, are arranged continuously. Thus the series is:

30 30
31 29
31 29
31 29
31 29
29
30

which is fairly symmetrical. Owing, however, to the working of the rule about *sankrāntis* before and after sunset, a month may have occasionally an extra day, and solar months with 32 days are not infrequent, as may be seen from the Ephemeris.

SECTION V.—*Lunar months in relation to solar months.*

79. The lunar months are the *doors* to the Indian calendar, but the solar months are the *hinges* on which the doors move. Every lunar month takes its name in Bengal from the solar month *in* which it occurs, and in the Tamil country from the *next* solar month after that in which it occurs.

80. Thus the lunar Vaiśākha *must* begin sometime in the solar Vaiśākha (Bengal) or sometime in the solar Chittirai (Tamil). The lunar month being only 29·53 days in length, there may be two new moons between the beginning and end of a solar month, and in this case *both* receive the same name, the first being called *adhika* or intercalary and the second *Nija* or true. The second is called "true" because it immediately precedes a sankrānti. *Adhika* months occur ordinarily once in three years, as may be seen from Table II (pages 200—279).

81. More rarely, that is about once or twice a century, a solar month may begin and end and no lunar month begin in the course of it and then some lunar month must be suppressed as there is no hinge on which this particular door can turn. The suppressed lunar month is said to be *kshaya* * or in defect.

82. We will now take three examples illustrating the different kinds of lunar years—(1) the year A.D. 1910–11 consisting of twelve lunar months, corresponding to as many solar months; (2) the year A.D. 1909–10 consisting of thirteen lunar months, which include an *adhika*, i.e., an extra or *intercalary* lunar month; (3) the year 1 B.C. or A.D. 0 consisting of thirteen lunar months, exhibiting two intercalary or *adhika* lunar months and one suppressed or *kshaya* lunar month: for whenever there is a kshaya month, there will ordinarily be two adhika months in the course of 12 months.

83. For the first we select the Indian year K.Y. 5011, A.D. 1910–11 and which is within our own time; for the second we select the year previous to it K.Y. 5010, A.D. 1909–10 also within our time; and for the third, because there has been no suppressed month since A.D. 1822, and there will be none till A.D. 1963, we select the first year of the Christian era, K.Y. 3101, 1 B.C., which is also the very first year entered in Table II (page 200) and will be made much use of, as a fixed year, in Chapter V on planetary chronology; unfortunately, as we shall notice in paragraph 310, page 127 below, 1 B.C. has *per se* little chronological interest except as a century year, because in all probability it was *not* the year when Christ was born; nevertheless it is an interesting year standing as it does at the parting of the ways.

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* Beginners find great difficulty in understanding *adhika* and *kshaya* months, because the idea is so utterly unlike anything in any other calendar; the examples given on the next and following pages are therefore purposely made somewhat prolix.

Scheme of months in K.Y. 5011, A.D. 1910–11—Sūrya siddhānta.

Lunar months.	A.D. date and fraction of day of mean new moon.	Day and fraction of day of solar year when mean new moon occurred, also sun's anomaly for new moon.	Day and fraction of day of solar year when sankrānti occurred; names of solar months commencing at each sankrānti. S.M. = Solar month.	Moon's anomaly at moment of each mean new moon. (To the ☾'s An. at first new moon of solar year add 1·976 days for each lunar month.)
	A.D. 1910. Indian solar year commences Ap. 13·2080. (Tab. II).		**K.Y. 5011.** Mēsha sankrānti Vaiśākha S.M.; Chittirai and Mēṭam S.M.; Solar year begins.	
1. Vaiśākha ...	May 9·1214.	25·9134 (Tab. II.)	30·9353 Ṛishabha sank. Jyeshṭha S.M.; Vaigāśi or Eṭavam S.M.	0·534 (Table II.)
2. Jyeshṭha ...	June 7·6520.	55·4440	62·3555. Mithuna sank. Āshāḍha S.M.; Āni S.M.	2·510
3. Āshāḍha ...	July 7·1826.	84·9746	94·0003 Karkaṭaka sank. Śrāvaṇa S.M.; Āḍi S.M.	4·486
4. Śrāvaṇa ...	Aug. 5·7132.	114·5052	125·4755. Siṁha sank. Bhādrapada S.M.; Āvaṇi S.M.	6·462
5. Bhādravada.	Sep. 4·2437.	144·0357	156·4942. Kanyā sank. Aśvina S.M.; Puraṭṭāśi S.M.	8·438
6. Āśvina ...	Oct. 3·7743.	173·5663	186·9355. Tulā sank. Kārttika S.M. (Beng.); Aippaśi S.M.	10·414
7. Kārttika ...	Nov. 2·3049.	203·0969	216·8289. Vṛiśchika sank. Mārgaśirsha S.M.; Kārttigai S.M.	12·390
8. Mārgaśīrsha.	Dec. 1·8355.	232·6275	246·3192. Dhanus sank. Pausha S.M.; Mārgaḷi S.M.	14·366
9. Pausha ...	Dec. 31·3661.	262·1581	275·6369. Makara sank. Māgha S.M.; Tai S.M.	16·342
	A.D. 1911.			
10. Māgha ...	Jan. 29·8967.	291·6887	305·0850. Kumbha sank. Phālguṇa S.M.; Māśi S.M.	18·318
11. Phālguṇa ...	Feb. 28·4273.	321·2193	334·9053. Mīna sank. Chaitra S.M.; Paṅguni S.M.	20·294
12. Chaitra ...	Mar. 29·9579.	350·7499	365·2587. Mēśha sank. Vaiśākha S.M.; Chittirai S.M.	22·270

N.B.—The main point to which the reader's attention should be directed in this scheme is that the lunar month following a new moon has its name determined by the fact of its occurring *before* a particular sankrānti. Thus, a lunar month commencing at any time between 0 day of the solar year and the 30·9353 day is called **Vaiśākha**; similarly, a lunar month commencing at any time between 156·4942 days and 186·9355 days of the solar year is called **Āśvina** and so forth. The lunar month commencing before the Mēsha sankrānti is called **Chaitra.**

84. The solar year K.Y. 5011, A.D. 1910, which was a normal year, opened, as does every year, with the *Mēsha sankrānti* or arrival of the sun at the point from which Indian celestial longitudes are reckoned. We have already seen how this moment is determined, namely, by the successive addition of 365·25876 days to the first moment of the year *Kaliyuga* 0, less the *śōdhya* of 2·1707 days. The *Mēsha sankrānti* determines nearly all kinds of solar years in use in India, and it also determines directly the lunar year, since the first lunar month *Chaitra* is defined

to be that whose commencement precedes the Mēsha sankrānti and the first day of the lunar year is that on which *Chaitra Śukla* pratipad or the first tithi of the bright fortnight of Chaitra was current at sunrise. In the scheme of months in Table II and elsewhere the reader will observe that the lunar month *Chaitra* stands last, but this is only for purposes of computation, and, after all, the lunar month *Chaitra* belongs to a previous solar year, and so it may be shown last among the lunar months of that year.

The moment of *Mēsha sankrānti* marks the commencement of the solar month *Vaiśākha* in Bengal, of the solar month *Chittirai* in the Tamil country, and of the solar month *Mēṭam* in Malabar, Travancore and Cochin.

Each month begins and ends with a sankrānti, and the second and other sankrāntis are named in the order of the constellations of the zodiac, *Ṛishabha*, *Mithuna*, etc.

85. There is no difficulty about the lunar months in A.D. 1910–11, since the new moons and sankrāntis then occurred *alternately*, each *door* having its own *hinge* to turn on. It will be a useful exercise to calculate the actual moment of occurrence of each new moon for which purpose the anomalies are noted in columns 3 and 5.

Scheme of months in the year A.D. 1909–10, K.Y. 5010.

Lunar months.	A.D. date and fraction of day of mean new moon.	Day and fraction of day of solar year when mean new moon occurred, also sun's anomaly for new moon. Add successively, for each new moon after the first, 29·53058 days.	Day and fraction of day of solar year when sankrānti occurred; names of solar months commencing at each sankrānti. S.M.=Solar month.	Moon's anomaly at moment of each mean new moon.	Sum of sun's and moon's equations (by Eye-table, sections e and h).
	A.D. 1909. Indian solar year commences. Ap. 12·2492 (Tab. II).		**K.Y. 5010.** Mēsha sankrānti Vaiśākha S.M.; Chittirai or Mēṭam S.M.; Solar year begins.		
1. Vaiśākha.	Apr. 20·2238	7·2745 (Tab. II).	30·9353. Ṛishabha sank. Jyeshṭha S.M.; Vaigāśi or Eṭavam S.M.	2·401 (Tab. II).	
2. Jyeshṭha.	May 19·7543	36·8051	62·3555. Mithuna sank. Āshāḍha S.M.; Āni S.M.	4·377	
3. Āshāḍha.	June 18·2849	66·3357	94·0003. Karkaṭaka sank. Śrāvana S.M.; Āḍi S.M.	6·353	
4 } Śrāvaṇa { 5	July 17·8155 Aug. 16·3461	95·8668 125·3970 − ·4481	125·4755. Simha sank. Bhādrapada S.M.; Āvaṇi S.M.	8·329 10·305 −·1250 (⊙'s Eq.)	−·1250 −·3231
		*124·9451		10·180	−·4481
6. Bhādrapada.	Sep. 14·8767	154·9275	156·4942. Kanyā sank. Āśvina S.M.; Puraṭṭāśi S.M.	12·281	
7. Āśvina ...	Oct. 14·4073	184·4581	186·9355. Tulā sank. Kārttika S.M. (Beng); Aippaśi S.M. (Tam.).	14·257	
8. Kārttika	Nov. 12·9379	213·9886	216·8289. Vṛiśchika sank. Mārgaśirsha S.M.; Kārttigai S.M. (Tam.).	16·233	
9. Mārgaśīrsha.	Dec. 12·4685	243·5192	246·3192. Dhanus sank. Pausha S.M.; Mārgaḷi S.M.	18·209	

* Actual moment of occurrence of new moon after allowing for equation in last column.

Scheme of months in the year A.D. 1909–10, K.Y. 5010—cont.

Lunar months.	A.D. date and fraction of day of mean new moon.	Day and fraction of day of solar year when mean new moon occurred, also sun's anomaly for new moon. Add successively, for each new moon after the first, 29·53058 days.	Day and fraction of day of solar year when sankrānti occurred; names of solar months commencing at each sankrānti. S.M. = Solar month.	Moon's anomaly at moment of each mean new moon.	Sum of sun's and moon's equations (by Eye-table, sections e and h).
	A.D. 1910.		**K.Y. 5010.**		
10. Pausha ...	Jan. 10·9990	273·0498	275·6369. Makara sank. Māgha S.M.; Tai S.M.	20·185	
11. Māgha ...	Feb. 9·5296	302·5804	305·0850. Kumbha sank. Phālguṇa S.M.; Māśi S.M.	22·161	
12. Phālguṇa ...	Mar. 11·0602	332·1110	334·9053. Mīna sank. Chaitra S.M.; Paṅguni S.M.	24·137	
13. Chaitra ...	Apr. 9·5908	361·6416	365·2587. Mēsha sank. Vaiśākha S.M.; Chittirai S.M.	26·113	

86. In this year, as in 1910–11, the lunar months, up to Śrāvaṇa, alternate with the solar months; but between the *sankrāntis* due at 94·30003 days and 125·4755 days of the solar year, we have two mean new moons at 95·8663 days and 125·3970 days, respectively. No anomaly can carry the first of these two new moons to a moment earlier than 95·28 days of the solar year. We may satisfy ourselves by computation of the anomalies, as shown above, that the second new moon really preceded the sankrānti which occurred at 125·4755 days. In such a case both the new moons receive the same name (here *Śrāvaṇa*), the first is called *adhika Śrāvaṇa* and the second *nija Śrāvaṇa*. After this, the numerical order of the lunar months is disturbed, for the sixth new moon is called Bhādrapada, whereas in 1910–11, the fifth is Bhādrapada, and the remaining new moons, including Bhādrapada, alternate with the remaining sankrāntis, the total number of new moons for the year being 13 instead of 12.

87. We now pass to the third example.

Scheme of months for 1 B.C., K.Y. 3101.

Lunar months.	Date of mean new moon by Christian era and fraction of day.	Day of solar year when mean new moon occurred; also sun's anomaly. Add successively, for each new moon after the first, 29·53058 days.	Day of solar year when sankrānti occurred, also dates of commencement and end of solar months. S.M. = Solar month.	Moon's anomaly at moment of new moon.	Sun's and moon's equations (by Eye-table, sections e and h).
	1 B.C. Indian solar year commences Mar. 13·9831 (Table II.)		**K.Y. 3101.** Mēsha sankrānti Vaiśākha S.M.; Chittirai or Meṭam S.M.		
1. Vaiśākha ...	Mar. 23·98	9·99810	30·93523. Rishabha sank. Jyeshṭha S.M.; Vaigāśi or Eṭavam S.M.	22·736	
2. Jyeshṭha ...	Apr. 22·51	39·52869	62·3555. Mithuna sank. Āshāḍha S.M.; Āni S.M.	24·712	

Scheme of months for 1 B.C., K.Y. 3101—cont.

Lunar months.	Date of mean new moon by Christian era and fraction of day.	Day of solar year when mean new moon occurred; also sun's anomaly. Add successively, for each new moon after the first, 29·53058 days.	Day of solar year when sankrānti occurred, also dates of commencement and end of solar months. S.M. = Solar month.	Moon's anomaly at moment of new moon.	Sun's and moon's equations (by Eye-table, sections e and h).
	1 B.C. Indian solar year commences Mar. 13·9831 (Table II, page 24)—*cont.*		**K.Y. 3101**—*cont.*		
3. Āshāḍha ...	May 22·04	69·05928	94·0003. Karkaṭaka sank. Śrāvaṇa S.M.; Āḍi S.M.	26·688	
4. Śrāvaṇa ...	June 20·57	98·58986	125·4755. Siṁha sank. Bhādrapada S.M.; Āvaṇi S.M.	1·109	
5. Bhādrapada.	July 20·10	128·12045	156·4942. Kanyā sank. Āśvina S.M.; Puraṭṭāśi S.M.	3·085	
6. **7.** **Āśvina** {	Aug. 18·68 Sep. 17·16	157·65104 187·18163 − ·5842 *186·5974	186·9355. Tulā sank. Kārttika S.M.; Aippaśi S.M.	5·061 7·037 − ·1724	 − ·1725 − ·4117
8. Kārttika ...	Oct. 16·69	216·71221 − ·5155 *216·1967	216·8289. Vṛiśchika sank. Mārgaśirsha S.M.; Kārttigai (Tam.) S.M.	6·865 9·013 − ·1290 8·884	− ·5842 − ·1290 − ·3865 − ·5155
9. Mārgaśīrsha.	Nov. 15·23	246·24280 − ·3223 *245·9205	246·3192. Dhanus sank. Pausha S.M.; Mārgaḷi S.M.	10·989 − ·0522 10·937	− ·0522 − ·2701 − ·3223
Pausha ...	**(Kshaya)**	.....	275·6369. Makara sank. Māgha S.M.; Tai S.M.		
10. Māgha ...	Dec. 14·176	275·77339 − ·0414 *275·7319	305·0850. Kumbha sank. Phālguṇa S.M.; Māśi S.M.	2·865 + ·0392 13·004	+ ·0392 − ·0808 − ·0414
	1 A.D.				
11. Phālguna ...	Jan. 13·29	305·30398 + ·2515 305·5555	334·9053. Mīna sank. Chaitra S.M.; Paṅguni S.M.	14·941 + ·1195 15·060	+ ·1195 + ·1320 + ·2515
12. **13.** **Chaitra** ... {	Feb. 11·82	334·83457 *+·4727 335·3073	365·2587.	16·917 + ·1687 17·085	+ ·1687 + ·3040 + ·4727
	Mar. 13·35	364·36515	Mēsha sank. Vaiśākha S.M.; Chittirai or Mēṭam S.M.	18·893	

In this year there is nothing specially worthy of note till we reach *Āśvina*: but for that month there is an *adhika Āśvina* just as we have an *adhika Śrāvaṇa* in A.D. 1909. There is a peculiarity about *nija Āśvina* in the year 1 B.C., which we must note carefully. The mean *nija Āśvina* at 187·1816 days is not before the sankrānti at 186·9355 days, but the actual new moon, after calculation of anomalies, is found to be at 186·5974, i.e., before 186·9355 days and is therefore *nija Āśvina*, not Kārttika. Generally speaking, when a *nija* or *adhika* month is within ·6 day on either side of a sankrānti, calculation, or at least a consideration, of the anomalies is necessary before we can determine its true character.

88. Passing Āśvina in the year 1 B.C. we find that each of the subsequent mean new moons is within ·6 day of a sankrānti, and we must therefore calculate

* Day and fraction of day, marking exact moment of actual new moon, after allowing for equations in last column.

the anomalies in order to be quite sure whether each new moon is on this or that side of a sankrānti. Having made these calculations, we find that between two sankrāntis, at 246·3192 days and 275·6369 days, there is no new moon, although there is a new moon just under six ghaṭikas (·095 days) *after* the second sankrānti. Had this new moon preceded the sankrānti ever so little, instead of following it, or had our method been inaccurate at this stage to the extent of 2 hours, the consequences we are about to state would not have followed. As it is, there is no new moon between the two sankrāntis at 246·3192 days and 275·6369 days and therefore the lunar month which has no hinge to turn on is shut ; this fact is expressed by sayingthat *Pausha* lunar month is *kshaya* or suppressed.

89. How do we know that the lunar month to be suppressed is *Pausha* and not any other ? Because that is the first new moon which we are unable to place *before* a sankrānti. We find that *Māgha* and *Phālguṇa* are each followed by a sankrānti, though a long way off, and between the sankrāntis at 334·9053 days and 365·2587 days there are again two new moons, that is to say, two Chaitras, the first of these being *adhika* and the second *nija*. Here also we note that appearances are deceptive, for the mean new moon at 334·8346 is apparently a Phālguṇa, but the calculation of the anomalies shows it to be an *adhika Chaitra*.

90. Generally (1) a *kshaya* month is preceded and followed, though not immediately, by an *adhika* month ; (2) there are, as a rule, only one or two *kshaya* months in a century ; (3) the *kshaya* months must be calculated from the mean moment by means of anomalies before we can prove them to be *kshaya* ; and (4) in the Sūrya and Ārya siddhāntas only one of three months, Mārgaśīrsha, Pausha, and Māgha, can be *kshaya*, because these are the three lunar months which turn on solar months of 29 days each.

The following table enables us to know an *adhika* month or a *kshaya* month in the Sūrya siddhānta calendar by mere inspection of the date of occurrence of the first new moon in a solar year. Similar tables can be constructed for the Ārya and Brahma siddhāntas and the Siddhānta Śiromaṇi with the aid of the figures showing the duration of the solar months according to each siddhānta :—

Names of lunar months. (1)	Ending days of solar months. (2)	Periods of lunar months. (3)	Limits of adhika and kshaya months. (4)
–			The lunar month noted in column 1 will be an *adhika* month if first new moon in solar year occurs
Vaiśākha ...	30·93526 d.	29·53059 d.	before 1·40469 d.
Jyeshṭha ...	62·35555 d.	59·06117 d.	,, 3·29438 d.
Āshaḍha ...	94·00028 d.	88·59176 d.	,, 5·40851 d.
Śrāvaṇa ...	125·47555 d.	118·12235 d.	,, 7·35320 d.
Bhādrapada ...	156·49417 d.	147·65293 d.	,, 8·84122 d.
Āśvina ...	186·93555 d.	177·18353 d.	,, 9·75201 d.
Kārttika ...	216·62888 d.	206·71411 d.	,, 10·11475 d.
			The lunar month noted in column I will be *kshaya* if first new moon in solar year occurs
Mārgaśīrsha ...	246·31916 d.	236·24470 d.	after 10·07446 d. and before 10·11475 d.
Pausha ...	275·63694 d.	265·77529 d.	after 9·86164 d. and before 10·07447 d.
Māgha ...	305·08499 d.	295·30588 d.	after 9·77910 d. and before 9·86164 d.
			The lunar month noted in column I will be *adhika* if first new moon in solar year occurs
Phālguṇa ...	334·90527 d.	324·83647 d.	after 9·77912 d. and before 10·06880 d.
Chaitra ...	365·25875 d.	354·36705 d.	after 10·06880 d. and before 10·89170 d.

N.B.—All the figures in column (4) are obtained by subtracting the corresponding figures in column (3) from hose in column (2).

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91. We see that if the first new moon in a solar year occurs before 1·40469 days (the difference between 30·93528 and 29·53059) of the solar year, there will be a second new moon before the end of the first solar month. Reasoning in the same manner, we see that if the first new moon in a solar year occurs after 1·40469 days, but before 3·29438 days of the solar year, there will be two new moons between the commencement of the first and second solar months, that is, there will be an *adhika* as well as a *nija Jyeshṭha*. Similar reasoning will enable us to connect the possibility of occurrence of the several *adhika* and *kshaya* months with the occurrence of the first new moon before or between the days mentioned in the fourth column. It will be a useful exercise for the reader to try and reason out for himself each line of this table. For determining *mean* intercalations and *mean* suppression, the table can be used as it stands; and taken with suitable anomalies, it is a safe and reliable guide for ascertaining true *adhika* and true *kshaya* months. The author believes that this is the first time that so simple a method has been indicated for recognizing *adhika* and *kshaya* months.

Section vi.—*Tithis.*

92. Tithis are in use over the whole of India for religious purposes and over the greater part of it for civil purposes also. To understand *tithis* thoroughly is to have mastered the system of the Hindu calendar. Tithis are as old as the Vedas.

93. A lunation or synodical month is divided into thirty tithis or lunar days of equal mean length. The names of tithis are familiar to all Hindus, but they are given for convenience of reference in Table I (**v**), page 198. The first fifteen tithis, corresponding to the bright half of the month, are called *śukla paksha*; and the second fifteen are called *krishna paksha* or *bahula paksha*. The last or 30th tithi is new moon or Amāvāsyā, and it is called sometimes by the name of the month of which it marks the end, and sometimes by the name of the following month. Thus the moment of Amāvāsyā which marks the beginning of Vaiśākha and which in this work is called the "Vaiśākha new moon" is the same as the ending moment of the 30th tithi of Chaitra and is usually called Chaitra Amāvāsyā. In an inscription* "Vaiśākha Amāvāsayā" usually means the Amāvāsyā at the *end* of Vaiśākha, but for convenience of computation, the first new moon in the solar year is in this work called the Vaiśākha new moon while the 30th tithi of Vaiśākha is called the Jyeshṭha new moon, and so on with the rest of the lunar months.

94. To find the mean ending moment of a particular *tithi*, it is only necessary to add the corresponding duration in days, according to Eye-table **y**, to the moment of the first new moon in the solar year, remembering that when a year contains an adhika month, as shown in Table II, the numbers of the months following the adhika month are changed.

Thus, to find the mean ending moment of the 18th tithi of Māgha lunar month, called *krishna* or *badi* (contraction for *bahula divasa*) *tṛitīyā* in K.Y. 5010, A.D. 1909–10, we proceed as follows:—

Moment of commencement of solar year A.D. 1910 (Table II) ...	April		12·9492
First new moon in solar year (Table II)			7·2745
As the year 1909–10 contains an adhika Śrāvaṇa month according to Table II, we take for the total duration up to Māgha badi 3, the duration of the corresponding tithi in the next ordinary month, i.e., Phālguṇa *badi* 3 according to Eye-table **y**			313·02426d
(Total) April 333·2479 = February 27·2479 in the following year (by Eye-table, section **q**).			

The *mean* tithi in question ended at ·2479 of the 27th day of February, A.D. 1910.

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* That is, on the *amānta* system or the system of reckoning lunar months from new moon to new moon. There is also another system prevalent in certain parts of India, of reckoning the lunar months from full moon to full moon, hence called the *pūrṇimānta* system. On this system, which in all probability was more widely current formerly than it is now, the new moon is at the middle of a lunar month and the two halves of each month are properly designated its two *pakshas* or wings, one on either side of new moon. Also, the new moon at the end of the amānta Chaitra lunar month, for instance, would, on the *pūrṇimānta* system, be properly called the "Vaisākha new moon." As explained elsewhere, it is sometimes a difficult question whether a lunar month, referred to in an inscription, is to be understood in the *amānta* or in the *pūrṇimānta* sense. See section xvii of this Chapter, page 52.

Actual ending moment of a tithi.

95. Sections **e** and **h** of the Eye-table contain all that is necessary for determining the actual ending moment of a tithi, provided we know from Table II, (1) the mean ending moment and (2) the moon's anomaly at that moment. These quantities (1) and (2) can be extracted from the Eye-table, sections **k** to **p**, as shown in the illustrative examples under each Eye-table, but it is far easier to obtain them from Table II. Table II was designed originally for the Sūrya siddhānta (the pages relating to A.D. 500 to A.D. 1,000 having been designed for the Ārya siddhānta); but the very slight corrections necessary for determining the mean ending moments of tithis (and consequently of nakshatras and yogas), by the other siddhāntas are shown at the foot of each page of Table II.

96. The shortest method of ascertaining the actual ending moment of a tithi when Table II as well as the Eye-table is used, is as follows :—

Required the actual ending moment of śukla chaturthī (fourth tithi in bright fortnight) in lunar *Kārttika* month in A.D. 1910–11.—

Sūrya siddhānta.

		Sun's anomaly in days.	Moon's anomaly in days.
(Table II) Commencement of solar year, 1910–11	Ap. 13·2080	...	...
First new moon in solar year, 1910–11	25·9134	25·9134	0·535
Duration in days from first new moon to Kārttigai su. 4 (Eye-table, Section **y**)	181·1209	181·1209	15·793
April	220·2423	207·0343	16·328
Equation of sun's anomaly for 207·03 days	...	...	—·1477 —·1477
			16·180
Equation of moon's anomaly for 16·180 days	...	...	+·2350
	+·0873	Sum of ☉'s and ☾'s equations	+·0873
April	220·3296		

By Eye-table, section **q**, April 220 = November 6; and by Eye-table, section **r**, ·3296 of a day = 19 ghaṭikas, 47 palas. We conclude that the tithi in question ended at 19 ghaṭikas 47 palas after mean sunrise on 6th November, A.D. 1910. The "Indian Ephemeris, A.D. 1800—2000" gives the ending moment as ·34 of the day. When two places of decimals are sufficient for the ending moment the "shortest method" for tithis, indicated in illustrative examples under Eye-table may be used.

SECTION vii.—*Nakshatras.*

97. The system of quoting dates by nakshatras is as old as that of quoting by tithis and has prevailed in India from Vedic times. There are twenty-seven nakshatras or lunar mansions through which the moon passes in her monthly journey through the stars. In the Sūrya siddhānta the moon is supposed to spend an equal amount of time in each of the 27 nakshatras; and as the total period of the moon's journey through the stars occupies 27·32166 days, it follows that the mean duration of each nakshatra is $\frac{27{\cdot}32166}{27}$ = 1·01191 days, i.e., 1 day and nearly 18 minutes. Thus, if we know the mean ending moment of a particular nakshatra, all we have to do to find out the mean ending moment of the next nakshatra, or, for that matter, of any other nakshatra, is to add as many times 1·0119 days as there are nakshatras between the ending moment which we know and the ending moment which we wish to find out. This process is carried out in Eye-table **s**. Having found this ending moment, we have next to add or subtract the moon's

equation of time according to her anomaly at the ending moment of the nakshatra. We should remember that the sun's anomaly and the sun's equation of time do not enter into the calculation of the ending moment of nakshatras, because we are now concerned with the moon's own journey among the stars and not with the distance gained by her over the sun.

Actual ending moment of a nakshatra.

98. Sections **s**, **t** and **u** of the Eye-table, together with section **f** of the same table contain all that is necessary for determining the actual ending moment of any nakshatra, provided we know the mean ending moment of the previous new moon and the anomaly of the moon at that moment. The ordinary working is as follows, and it should be carefully noted:—

Required the ending moment of nakshatra Mūla (No. 19 Nak.) in lunar Kārttika month, A.D. 1910.

SŪRYA SIDDHĀNTA.

	Days.	☾'s anomaly Days.
(Table II) Commencement of Indian solar year, 1910–11 ... April	13·2080 ...	0·535
First new moon in solar year	25·9134	11·856
(Eye-table **y**) days up to Kārttika new moon ...	177·1835	
Place of nakshatra Mūla in ordinary Kārttika, according to Eye-table, section **s**, is 3·9263 days after new moon. For every year, we have to make a nakshatra correction according to sections **t** and **u** of the Eye-table, corresponding to the interval of the first new moon in the solar year. This interval in the year 1910–11 A.D. being 25·9134 days (by Table II,) section **u** of the Eye-table gives us, as the correction corresponding to ·9134, ·06807 + ·00025= ·0683, i.e., the correction for ·91 *plus* the correction for ·0034. This correction ·06832 should be subtracted from the correction for 25 days according to section **t**, i.e., 0·33888. Now 0·33888 *minus* ·06832 = ·27056. This quantity has to be added to the general nakshatra interval according to section **s**, 3·9263 days. Now 3·9263 + ·2706 = 4·1969	4·1969	4·1969
Total... April	220·5018	16·5880
The moon's anomaly for the mean ending moment of the nakshatra being 16·588 days, the equation for this anomaly by the Eye-table, section **f** is + ·2465	+·2465	
Total April	220·7483	

April 220 being by Eye-table, section **q**, November 6, and ·7483 of a day being by Eye-table, section **r**, 44 ghatikas and 55 palas, we conclude that *Mūla* nakshatra in lunar Kārttika month in A.D. 1910–11 ended at 44 ghatikas 55 palas after mean sunrise on 6 November 1910. The ending moment according to "Indian Ephemeris" for 1800—2000 A.D. is ·75 on 6 November 1910.

99. Nakshatras are very important in South Indian epigraphy and we shall next work out a somewhat complicated problem of ordinary occurrence, namely—

"Required to find, by Ārya siddhānta, the nakshatra, and the date of the Tamil solar month, on bahula 8th tithi (day of commencement) in Āḍi month, A.D. 756."

This particular problem possesses an intrinsic interest on account of its probable connexion with the "Aḷal kādai" or "Burning of Madura" in Kōvalan's famous story told in the Tamil classic *Śilappadikāram.* (See paper iii in Appendix).

In nakshatra problems we should first examine the first new moon in the solar year. By Table II the first new moon in solar year A.D. 756–57 occurred at 14·92 days of the solar year. We shall want the nakshatra correction corresponding to this period and might find it at once. By Eye-table, sections **t**, **u**, the nakshatra correction for 14·92 days = 1·16 — ·07 = 1·09 days. Āḍi or Karkaṭaka solar month lasts (by Ārya siddhānta, Eye-table, section **a**) from 93·93 days to 125·401

days of the solar year. The lunar month which must begin in this period, when there is no adhika month is Āshāḍha (see Eye-table, section **b**); and Āshāḍha in this particular year would begin 59·06+14·92 = 73·98 days later than the solar year. The interval from Āshāḍha new moon to end of bahula 7th tithi is the duration of 22 tithis or 21·66 days (Eye-table, section **d**) and about the end of these 21·66 days there would be according to Eye-table, section **s**, No. 27 Rēvatī nakshatra (20·86+ nakshatra correction already ascertained 1·09 days or 21·95 days in all). The day of solar year would then be 73·98 + 21·95 = 95·93 days (up to the end of Revatī nakshatra in Āshāḍha month). But we also see that before the end of Āḍi month which only begins at 93·93 days there may be another Rēvatī nakshatra. If so, that would be in Srāvaṇa lunar month, in which, however, about the end of bahula 7th tithi or 21·66 days, nakshatra No. 2, Bharaṇī whose interval in this particular month is 20·67 days increased (for A.D. 756–57) by the nakshatra correction, 1·09 days, to 21·76 days, will have come to an end. We work, according to the shortest method exemplified in the Eye-table for the ending moment of 7th bahula tithi and No. 2 Bharaṇī nakshatra.

(Col. 1)	(Col. 2)	(Col. 3)	(Col. 4)	(Col. 5)	(Col. 6)
			DAYS.	DAYS.	
(Table II) Ending moment of Śrāvaṇa new moon tithi, A.D. 756-57.	For ending moment of tithi. (6) July 2·09	First new moon, solar year.	14·92	...	For ending moment of nakshatra.
⊙'s equation for 125·17 days = − ·01.	Mean tithi end. 21·66	Anomaly of first new moon in solar year	...	10·82	New moon (6) July 2·09
☾'s equation for 11·85 days (Col. 5) − ·012 (⊙'s equation) or 11·84 days = − ·19.		Add for Śrāvaṇa, bahula 7 (Eye-table, section **y**).	110·25	0·03	Nakshatra interval. 21·76
Sum of ⊙'s and ☾'s equations for tithis = − ·01 − ·19 = − ·20.	Tithi equation. ·20		125·17	11·85	Nakshatra equation (Col. 1). − ·17
☾'s nakshatra equation for 11·95 days = − ·17.	Actual end (6) July ... 23·55	Difference between ending moment of ba. 7 tithi and No. 2 nakshatra (see above) 21·76 − 21·66.	...	= + ·10	(6) July 23·69
		Anomaly of moon at ending moment of No. 2 nakshatra.	...	11·95	

From Table II, we note that the Indian solar year A.D. 756–57 began on March 20·58 to which we add for beginning of Āḍi:

March 20·58
,, 93·93

March 114·51 = June 22.

According to the sankrānti rule observed in the Tamil country Āḍi must have begun not on June 22 but on June 23.

Since we have reached July 23 by the end of both nakshatra and tithi, we say that July 23 = June 53 = June 23 + 30, or 31st of Āḍi, provided that Āḍi lasted so long in the year in question.

In A.D. 756–57, the Simha or Āvani sankrānti would commence on March 20·58 + 125·40 = March 145·98 = July 23·98 (Eye-table, section **q**); by sankrānti rule, Simha month would in these circumstances begin only on 24 July: so that the 23 July A.D. 756 when ŚRĀVAṆA BAHUḶA 7 and Nakshatra BHARAṆĪ came to end at ·55 and ·68 respectively of the day, was a FRIDAY and the 31ST AND LAST DAY OF ĀḌI.

100. Besides the system (followed in Sūrya and Ārya siddhāntas) of the division of the moon's path among the stars into 27 equal nakshatra spaces, there are two others, called Garga's system and Brahma's system, by which the sidereal month of 27·32166 days is divided into 27 convenient but *unequal* stages. Table I, page 199, gives the collective duration of the nakshatras according to the unequal systems, and the ending moment of each nakshatra according to either of these systems can be found by adding the corresponding collective duration to the ending moment of the last nakshatra Rēvatī, which should be first determined. For Brahma siddhānta this process is carried out in the Eye-table of that siddhānta, section **s**.

101. The following table shows the identification of the nakshatras with fixed stars by various authorities :—

Nakshatras.

Order and names of nakshatras.	Collective duration of Nakshatras (equal spaces).	Deities presiding over nakshatras.	Identified by Burgess with	Identified by Colebrooke with	Identified by Bentley with
	DAYS.				
1 Aśvinī	1·01	Aśvine ...	*Beta* Arietis ...	*Alpha* Arietis ...	*Gamma* or *Beta* Arietis.
2 Bharaṇi	2·02	Yama ...	*Alpha* Muscæ ...	Muscæ	35 Arietis.
3 Kṛittikā (Tam. Kiruttigai).	3·04	Agni ...	23 Tauri	*Pi* Tauri	Alcyone (*Heta* Pleiadum).
4 Rohiṇī	4·05	Prajāpati ...	Al-Dabaran, *Alpha* Tauri.	*Alpha* Tauri ...	Aldebaran.
5 Mṛigaśirā (Tam. Mirugaśiram).	5·06	Soma ...	*Lamda* Orionis ...	*Lambda* Orionis ...	113, 116, 117 Tauri.
6 Ārdrā (Tam Arudra or Tiruvādirai).	6·07	Rudra ...	*Alpha* Orionis (?) ...	*Alpha* Orionis ...	133 Tauri.
7 Punarvasu	7·08	Aditi ...	*Beta* Geminorum ...	*Beta* Geminorum ...	Pollux.
8 Pushyā (Tam. Pūsam).	8·09	Bṛihaspati ...	*Delta* Cancri ...	*Delta* Cancri ...	*Delta* Cancri.
9 Āśleshā (Tam. Āyilyam).	9·11	Sarpāh ...	*Epsilon* Hydræ ...	*Alpha*, 1 and 2 Cancri.	49, 50 Cancri.
10 Maghā (Tam. Magham).	10·12	Pitarah ...	Regulus	*Alpha* Leonis ...	Regulus.
11 Pūrva Phalgunī (Tam. Pūram).	11·13	Bhaga ...	*Delta* Leonis ...	*Delta* Leonis ...	70, 71 Leonis.
12 Uttara Phalgunī (Tam. Uttiram).	12·14	Aryaman ...	Al-Sarfa, *Beta* Leonis.	*Beta* Leonis ...	*Beta* Leonis.
13 Hasta (Tam. Hastam).	13·15	Savitṛi ...	*Gamma* or *Delta* Corvi.	*Gamma* or *Delta* Corvi.	7, 8 Corvi.
14 Chitrā (Tam. Chittirai).	14·17	Tvashṭṛi ...	Spica Virginis ...	*Alpha* Virginis ...	Spica.
15 Svāti	15·18	Vāyu ...	Arcturus	*Alpha* Boötes ...	Arcturus.
16 Viśākhā (Tam. Viśākam).	16·19	Indrāgni ...	*Iota* Libræ ...	*Alpha* or *Chi* Libræ.	24, Libræ.
17 Anurādhā (Tam. Anusham).	17·20	Mitra ...	*Delta* Scorpionis ...	*Delta* Scorpionis ...	*Beta* Scorpionis.
18 Jyeshṭhā (Tam. Kettai).	18·21	Indra ...	Antares	*Alpha* Scorpionis ...	Antares.
19 Mūla (Tam. Mūlam)	19·23	Nirṛiti ...	*Lambda* Scorpionis.	*Lambda* Scorpionis.	34, 35 Scorpionis.
20 Pūrvā Āshāḍhā (Tam. Pūrādam).	20·24	Āpah ...	*Delta* Sagistarii ...	*Delta* Sagittarii ...	*Delta* Sagittarii.
21 Uttara Āshāḍhā (Tam. Uttirādam).	21·25	Viśvedevāh ...	*Sigma* Sagittarii ...	*Tau* Sagittarii ...	*Phi* Sagittarii.
21-A. Abhijit*	...	Brahma ...	Al-Nasr Al-waqi', Vega.	*Alpha* Lyræ ...	Vega.
22 Śravaṇa Tam. (Tiruvōṇam).	22·26	Vishṇu ...	Al-Nasr Al-tair, *Alpha* Aquilæ.	*Alpha* Aquilæ ...	*Alpha* Aquilæ.
23 Śravishṭhā or Dhanishṭhā (Tam. Aviṭṭam).	23·27	Vasavah ...	*Beta* Delphini ...	*Alpha* Delphini ...	*Beta* Delphini.
24 Śatabhishaj or Śatatārakā (Tam. Sadāyam).	24·29	Varuṇa ...	*Lambda* Aquarii ...	*Lambda* Aquarii ...	*Lambda* Aquarii.
25 Pūrva Bhādrapadā (Tam. Pūraṭṭādi).	25·30	Aja Ekapād ...	*Alpha* Pegasi ...	*Alpha* Pegasi ...	*Alpha* Pegasi.
26 Uttara Bhādrapadā (Tam. Uttiraṭṭādi).	26·31	Ahirbudhnya.	*Gamma* Pegasi or *Alpha* Andromedæ.	*Alpha* Andromedæ	*Gamma* Pegasi.
27 Revati	27·32	Pūshan ...	Zeta Piscium ...	Zeta Piscium ...	Zeta Piscium.

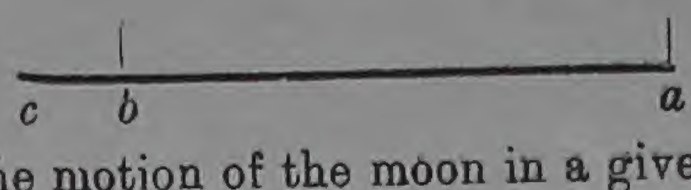
* Abhijit is not reckoned when only 27 nakshatras are spoken of.

SECTION viii.—*Yogas.*

102. As explained in paragraph 58, page 19 *supra*, a yoga is the time during which the sun and moon together accomplish 13 degrees 20 minutes of space. There are thus 27 yogas which together make 360°. The names of all the yogas

are given in Eye-table, section v, from which it will be seen that the collective duration of 27 yogas is 25·42020708 days by Sūrya siddhānta and by Brahma siddhānta, 25·42020574 days.

103. Unlike tithis and nakshatras, yogas do not represent the stages of the actual motion of any heavenly body or of a set of heavenly bodies. They are in fact the result of a mathematical rather than of an astronomical conception. If we draw a line



where $b\,a$ represents the motion of the moon in a given time and $c\,b$ the motion of the sun in the same time, it follows that $c\,a$—$c\,b$ is the moon's elongation or the space gained by the moon over the sun in the given time. If we regard separately the spaces travelled by the sun and the moon in this time, we might say that together they have done $c\,a + c\,b$. This $c\,a + c\,b$, then, is the yoga, while $c\,a - c\,b$ is the tithi. To derive the yoga from the tithi, we may make use of the formula

$$c\,a - c\,b + 2\,c\,b = \text{yoga}.$$

where $c\,a$ and $c\,b$ are respectively the moon's and sun's longitude, but in the present method it is far simpler to follow the Eye-table method shown below :—

Actual ending moment of a yoga.

104. Sections **v**, **w**, **x** of the Eye-table, together with sections **e** and **g** of the same table contain all that is necessary for determining the actual ending moment of a yoga, provided we know the mean ending moment of the previous new moon and the sun's and moon's anomaly at that moment, for which purpose we may use again the Eye-table, as shown in the illustrative examples appended to each Eye-table; but it is easier to extract the quantities we require from Table II as follows :—

Required the ending moment of yoga Siddhi (No. 16 yoga) in lunar *Kārttika* month in A.D. 1910–11.

The normal interval of yoga *siddhi* (No. 16) in the month in question is 12·0136 days after Kārttika new moon. For the year 1910–11 we have to lengthen this interval by a correction which depends on the interval of the first new moon in the solar year (25·9134 days by Table II). Exactly as we did in the case of a nakshatra (page 33 supra) we find from Eye-table, sections **w** and **x** the correction corresponding to 25·9134 days, i.e., 0·63061 $-\begin{cases} \cdot12666 \\ +\cdot00047 \end{cases}$

$$\begin{array}{rr} -\cdot12619 & \cdot12619 \\ +\cdot5044 & \end{array}$$

Adding ·5044 to the normal yoga interval 12·0136, we have 12·5180. With this result we proceed as we did for a nakshatra, remembering that sun's and moon's anomalies and equations are both necessary for yogas.

(Table II).	—	Sun's anomaly in days.	Moon's anomaly in days.	Equations.
Commencement of solar year 1910–11.	Ap. 13·2080	...	...	...
First new moon in solar year 1910–11.	25·9134	25·9134	0·535	...
Duration in days from first new moon to Kārttika new moon (Eye-table **y**)	177·1835	177·1835	11·856	...
	216·3049	203·0969	14·391	
		Sun's anomalistic equation for 203·10 days.	+·1323	☉'s +·1323
		Moon's yoga equation for	14·523 days	☾'s +·0661
Sum of ☉'s and ☾'s eqn. ...	+·1984			+·1984
	April 216·5083	...	...	

By Eye-table section q, April 216 = November, 2; and by Eye-table section r ·5033 of a day = 30 ghaṭikas 12 palas. We conclude that yoga Siddhi in lunar Kārttika month in A.D. 1910-11 ended at 30 ghaṭikas 12 palas after mean sunrise on the 2nd November A.D. 1910.

105. Yogas in their astronomical sense are not very much in use at present, but certain astrological *yogas* (Amṛitayoga, Siddhayoga, Maraṇayoga) are much more in use, being based on combinations of nakshatras with certain week-days. These so-called *yogas* are not alluded to in the epigraphical period.

Apart from inscriptions dated in the Vikrama era, where yogas proper are freely cited, one hears of the *yoga* proper in such auspicious combinations as the following :—

Kapilashashṭhī, i.e., the combination of Bhādrapada krishṇa shasṭhī (in a year in which either Bhādrapada or some previous lunar month is *adhika*) with nakshaṭra *Rohiṇī* and yoga *Vyatīpāta* on a Tuesday. The combination is proverbially rare and supposed to be very difficult to foresee, but it can be easily predicted by means of the present method. Look in Table II for Bhādrapada mean new moon (in a year having this or some previous month as *adhika*) falling on a Wednesday, mean ending moment being less than ·50, and calculate *Rohiṇī* nakshatra and *Vyatīpāta* yoga for that month. Of course the tithi, the nakshatra, or the yoga *may* fall on Monday or Wednesday, and then there will be no *Kapilashashṭhī*.

N.B.—In A.D. 17, A.D. 193, A.D. 396, A.D. 440..... A.D. 1513 there were *Kapilashashṭhis*: none between A.D. 1840 and A.D. 2000. Let the student try A.D. 1736 and A.D. 1787.

Ardhōdaya yoga, i.e., a combination on a *Sunday* by day-time, of nakshatra *Rohiṇī*, yoga *Vyatīpāta*, and *Māgha* Amāvāsyā (i.e., the Amāvāsyā at the *end* of lunar Māghā).

Champa Shashṭhī, i.e., a combination on a *Sunday* or *Tuesday* of *Mārgaśīrsha* śukla shashṭhī with nakshatra *Satabhishaj* and yoga *Vaidhriti*.

Mahāmahā Varunī, i.e., a combination of *Phālguṇa* krishṇa trayodaśī with *Saturday* and nakshatra *Satabhishaj* and yoga *Śubha*.

Daśaharī, i.e., a combination in the *forenoon* of *Jyēshṭha* śukla daśamī with *Wednesday* (or *Tuesday*) and nakshatra *Hasta* and yoga *Vyatīpāta*.

Mahāsivarātri, i.e., Māgha kṛishna chaturdaśī combining at *midnight* with *Sunday* or *Tuesday*, nakshatra Śravaṇa and yoga *Śiva*.

Section ix.—*Karaṇas*.

106. The list of *karaṇas* is given in Table I. Every tithi is divided into two *karaṇas*, and the ending moment of the second of every set of two *karaṇas* coincides with the ending moment of a tithi. For the other *karaṇa* all we have to do is to add half a tithi, ·49217 day, to the last mean tithi, as well as to the corresponding solar and lunar anomalies and calculate from these data the absolute ending moment of the *karaṇa* thus :—

—	—	Sun's anomaly in days.	Moon's anomaly in days.
On 27 February 1910 the mean tithi (18th) ended at	·2479 day.	320·30	12·324
For the 37th *karaṇa* (*Bava*) add	·4922	·49	·492
Total ...	·7401 day.	320·79; ⊙'s Eqn. + ·1501.	12·816 + ·150 = 12·966.
☾'s Equation—·0840			
Sum of the equations + ·1501 — ·0840 = ...	+ ·0661		
	·8062 day, i.e., the *karaṇa Bava* ended at 48 ghaṭikas 22 palas on 27 February 1910.		

107. Properly speaking, two karaṇas ought to be shown in the panchānga, corresponding to every tithi: but the panchāngas in practice mark only that karaṇa whose ending moment is 30 ghaṭikas or less from sunrise. If the tithi itself ends at 30 ghatikas or less from sunrise, the same ending moment is entered in the panchāngas against both tithi and karaṇa. In the above case, i.e., on 27 February 1910, the 36th karaṇa *Vishti* (called *Bhadra* in the Tamil country) will be found marked in the panchāngas as having the same ending moment as the tithi.

SECTION X.—*Ahas.*

108. Having discussed the five component parts of a panchānga proper, viz., *vāra*, *tithi*, *nakshatra*, *yoga* and *karaṇa*, it remains to notice two other entries usually found in a line with the first five, viz., the *ahas* and the *tyājyam*.

109. The *ahas* or duration of daylight is simply the normal period of daylight in India, viz., twelve hours or 30 ghaṭikas, with the corrections for sunrise and sunset, deduced according to the rules to be presently laid down. Thus, if on a particular day the sun rose at 5-25 a.m. and set at 6–20 p.m. the *ahas* would be 12 hours + 35′ + 20′ = 12 hours 55 minutes, or 32 ghaṭikas 18 palas.

SECTION XI.—*Tyājyam.*

110. The *tyājyam* (lit., portion to be abandoned for purposes of business) is a definite portion of the total duration of each *nakshatra*, which portion is considered inauspicious. If the *tyājyam*, always reckoned from the first moment of each nakshatra, ends by day, it is called a day-tyājyam, and if it ends by night, it is called a night-tyājyam, and in the latter case it is usual to deduct the *ahas* and state that the *tyājyam* ends so many ghaṭikas and palas after sunset.

111. The following are the fractional parts which are *tyājyam* for the several nakshatras:—

	Tyājyam.
1 Aśvinī (five-sixths)	$\frac{5}{6}$
2 Bharaṇi (two fifths)	$\frac{2}{5}$
3 Kṛittikā (one-half) ... ... (Tam. Kiruttigai)	$\frac{1}{2}$
4 Rohiṇī (two-thirds)	$\frac{2}{3}$
5 Mṛigaśiras (seven-thirtieths) ... ... (Tam. Mirugaśīram)	$\frac{7}{30}$
6 Ārdrā (seven-twentieths) ... ... (Tam. Arudra or Tiruvādirai)	$\frac{7}{20}$
7 Punarvasū (one-half)	$\frac{1}{2}$
8 Pushyā (one-third) ... ... (Tam. Pūsam)	$\frac{1}{3}$
9 Āśleshā (eight-fifteenths) ... ... (Tam. Ayilyam)	$\frac{8}{15}$
10 Maghā (one-half) ... ... (Tam. Magham)	$\frac{1}{2}$
11 Pūrva Phalguṇī (one-third) ... ... (Tam. Pūram)	$\frac{1}{3}$
12 Uttara Phalguṇī (three-tenths) ... (Tam. Uttaram)	$\frac{3}{10}$
13 Hastā (eleven-thirtieths) ... ... (Tam. Hastam)	$\frac{11}{30}$
14 Chitrā (fourteen-fifteenths) ... ... (Tam. Chittirai)	$\frac{14}{15}$
15 Svāti (seven-thirtieths)	$\frac{7}{30}$
16 Viśākhā (seven-thirtieths) ... ... (Tam. Viśākam)	$\frac{7}{30}$
17 Anurādhā (one-sixth) ... ... (Tam. Anusham)	$\frac{1}{6}$
18 Jyeshṭhā (seven-thirtieths) ... ... (Tam. Kēṭṭai)	$\frac{7}{30}$
19 Mūlā (one-third) ... ... (Tam. Mūlam)	$\frac{1}{3}$
20 Pūrva-Āshāḍhā (two-fifths) ... ... (Tam. Pūrāḍam)	$\frac{2}{5}$
21 Uttara Āshāḍhā (one-third) ... ... (Tam. Uttirāḍam)	$\frac{1}{3}$
22 Śravaṇa (one-sixth) ... ... (Tam. Tiruvōṇam)	$\frac{1}{6}$
23 Śravishṭhā or Dhanishṭhā (one-sixth). (Tam. Aviṭṭam)	$\frac{1}{6}$
24 Śatabhishaj or Satataraka (three-tenths) ... ... (Tam. Sadayam)	$\frac{3}{10}$
25 Pūrva-Bhādrapadā (four-fifteenths) ... (Tam. Pūraṭṭādi)	$\frac{4}{15}$
26 Uttara Bhādrapadā (two-fifths) ... (Tam. Uttiraṭṭādi)	$\frac{2}{5}$
27 Revatī (one-half)	$\frac{1}{2}$

N.B.—Authorities differ as to the *tyājyam* for certain of the nakshatras: for instance, Mr. Śrauti, the well-known publisher of Driggaṇitapanchāngas, has informed the author that his tyājyams for nakshatras Nos. 13, 14, and 19 are $\frac{7}{20}$, $\frac{1}{3}$, and $\frac{14}{15}$ (instead of $\frac{11}{30}$, $\frac{14}{15}$, and $\frac{1}{3}$), respectively.

112. The method of working out the *tyājyam* is simple. We take the total duration of each nakshatra from the ending moment of the previous nakshatra up to its own ending moment and cut off the *tyājyam*.

Thus, 12 July 1910, nakshatra ended Uttara Phalgunī at Madras at 51 ghaṭikas 50 palas.

On 13 July 1910, the next nakshatra Hastā ended in the same latitude at 56 ghaṭikas 30 palas.

The total duration of the nakshatra Hastā was, therefore, 64 ghaṭikas 40 palas.

The *tyājyam* for Hastā is $\frac{11}{30}$.

Now, $\frac{11}{30}$ of 64 ghaṭikas 40 palas = 11 × (2 ghaṭikas 9 palas) = 23 ghaṭikas 39 palas.

∴ The tyājyam for nakshatra Hasta ended on
12 July 1910, 51 ghaṭikas 50 palas + 23 ghaṭikas 39 palas = 13 July 1910, 15 ghaṭikas 29 palas, which was a day *tyājyam*.

Again, on 20 July 1910, nakshatra Mūla No. 19, ended at 31 ghaṭikas 56 palas.
On 21 July 1910, nakshatra Pūrva Āshādhā No. 20, ended at 35 ghaṭikas 36 palas.

∴ Total duration of Pūrva Āshāḍhā was 63 ghaṭikas 40 palas,

of which the *tyājyam* was $\frac{2}{5}$, i.e., 2 × (12 ghaṭikas 44 palas) = 25 ghaṭikas 28 palas.

∴ Tyājyam for Mūla ended on 20 July 1910 at 57 ghaṭikas 24 palas;
which, being night-time, we deduct the *ahas*, 31 ghaṭikas 27 palas (arrived at in accordance with subsequent rules regarding sunrise and sunset);
∴ Tyājyam ended at 25 ghaṭikas 57 palas after sunset on 20 July 1910, and was a night *tyajyam*.

Section xii.—*Sunrise.*

113. Time is reckoned in Indian astronomy, in the first instance, from Lankā* sunrise, and corrections are then applied so as to arrrive at the time reckoned from local sunrise. These corrections are three in number:—

(1) A correction for terrestrial longitude;
(2) A correction for equation of time;
(3) A correction for the sun's tropical longitude.

114. To understand the nature of these corrections, we shall give in popular language the astronomical theory of local time, as applied by Indian astronomers.

(1) *Correction for terrestrial longitude.*—If the sun moved uniformly along the celestial equator, all places on earth would have sunrise at exactly 6 a.m., local time. On this supposition local time for any moment of the day could be deducted from Lankā time by adding or subtracting four times as many minutes of time as there are degrees of longitude between Lankā (or Ujjain) and the given place. The longitude of Ujjain being 76° East of Greenwich, any place whose longitude is more than 76° from Greenwich has a positive correction, and any place whose longitude is less than 76° has a negative correction for terrestrial longitude. For example: the longitude of Madras being $80\frac{1}{2}°$ east of Greenwich, i.e., $4\frac{1}{2}°$ more than Ujjain, local time at Madras is obtained from Lankā time by adding $4\frac{1}{2}° \times 4' = 18$ minutes of time.

N.B.—A meridian of terrestrial longitude makes a revolution of 360° in 24 hours, that is, it revolves 1° in (24 × 60 ÷ 360 =) 4 minutes. This interval of 4 minutes may be called the *time-difference* corresponding to a degree of terrestrial longitude.

The time-difference or correction for terrestrial longitude for nearly 200 important places in India (their importance being gauged by their population according to the Census Report of 1911) is given at the end of Table III. The correction is given in seconds of time which can be converted into *paias* or *vināḍis* by simply dividing the correction by 24.

(2) *Correction for equation of time.*—The sun does not move uniformly throughout the year. Hence, for each day of the solar year, we have to apply a correction which depends on the day's equation of the centre. The correction for each day of the solar year on account of the equation of time may be expressed in seconds of time.

(3) *Correction for the sun's tropical longitude.*—The sun does not move along the equator, as in our first supposition, but along the ecliptic; and therefore it is only at the points where the ecliptic cuts the equator, i.e., at the moments of vernal and autumnal equinox that the first supposition holds good. At other times of the year, a correction has to be applied, depending on the sun's tropical longitude, i.e., on his distance from either equinox measured along the ecliptic.

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* Lankā is an imaginary island supposed to be situated on the equator on the meridian of Ujjain, the Indian Greenwich—*vide* paragraph 20, page 5 *supra*.

115. Now, how are we to determine the sun's tropical longitude? The longitude that is given by the day of the Indian solar year is a sidereal longitude, i.e., the longitude of the sun measured from a fixed point of the ecliptic, which fixed point was the true vernal equinox about A.D. 500 or Kaliyuga 3600. Every year since then, the vernal equinox has been moving further and further away from that fixed point, and the sun's tropical longitude for any year subsequent to Kaliyuga 3600 must be found by adding to his sidereal longitude 3 degrees for every subsequent period of 200 years.* In this portion of the treatise degrees are always converted into days, and for the purpose of Sūrya siddhānta tithis, the tropical longitude for any day in any year is determined *by adding to the day of the solar year* 1 *day for every* 64 *years expired since Kaliyuga* 3740 (*A.D.* 639). Other siddhāntas give the precession as 1 day for every 60 years, which is more correct than 1 day for every 64 years.

By reckoning 3740 Kaliyuga and not 3600 Kaliyuga as the date of coincidence of the sidereal and tropical longitude, we eliminate the śodhya of 2·1707 days (Sūrya siddhānta) ; otherwise we would have to deduct the śodhya from the day of the solar year in order to arrive at the sidereal longitude and then add to the sidereal longitude so arrived at as many days as there were periods of 64 years since 3600 Kaliyuga. (2·1707 × 64 = 139·9248, which is nearly 140.)

116. We mentioned the śodhya in a general way in paragraph 66 *supra*, and shall revert to it more fully in paragraphs 189 *et seq*. Meanwhile we may interpret the śodhya in the following manner. The sun's equation of the centre, according to Table IV-A on 0 day of the solar year, is + 2·1378 degrees, which, by Table IV-C is the sun's motion for 2·17 days. In other words, when the mean sun is at 0 day of the solar year, the actual sun has already done 2·17 days journey of his annual course. Therefore, whenever we wish to express in days the sidereal longitude of the sun, i.e., his distance from the position he occupied on 0 day of the mean solar year, we deduct the śodhya of 2·1707 days from the day of the solar year we are at.

117. For the year A.D. 1279 the tropical longitude is found by adding to the day of the solar year $\frac{1279 - 639}{64} = \frac{640}{64}$, i.e., exactly 10 days, and this addition holds good strictly for 64 years, i.e., for 32 years before and 32 years after A.D. 1279 or from A.D. 1247 to A.D. 1311. For 30 important places in India, including one for every degree of North Latitude between 8° and 35°, the total of all the three corrections for the year A.D. 1279 is given in Table III for each day of the solar year. In this table the correction for tropical longitude which applies to the year A.D. 1279 may be assumed to apply to the whole of the epigraphical period of 400 years from A.D. 1000 to 1400 (vide paragraph 1) instead of only to the period of 32 years before and after A.D. 1279. There is no great error in this assumption, but of course direct calculation may be made, if the reader so pleases, for each case under examination. Further, the same table gives the equivalence of English and Indian solar dates for all solar years which commenced on the 25th March ; for other years we must make a *deduction* or *addition* according as the Indian solar year in question commenced *after* or *before* 25th March.

118. With these elementary notions on time, we are ready to work out quite accurately (according to the siddhāntas) any problem in local time. We shall work out, by way of illustrations, the somewhat formidable array of problems which are presented in Professor Jacobi's learned article in Volume II of the *Epigraphia Indica*.

(i) Kaliyuga 4128; 4 Bhādrapada (Bengal solar month) ; place RATNAGIRI (17° N. Lat.).

Correction (1) for terrestrial longitude ; — 34 vināḍis. (We do not use this correction.)

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* This is the correction for precession of equinoxes. The addition to be made to Indian sidereal longitudes on account of the precession of equinoxes is given in degrees in paragraph 229, page 94, under chapter V. "Planetary Chronology" for various epochs from A.D. 532 to A.D. 2051.

Correction (2), equation of time: for 4 Bhādrapada, i.e., the 129th day of solar year, in 17° lat. + 425 seconds.
Correction (3), tropical longitude for Kaliyuga 4128, 4 Bhādrapada: the number of days to be added to 129 is $\frac{4128-3740}{64} = \frac{388}{64} = 6$.
Now, 129 + 6 being 135, it follows that correction (3) is that for the 135th day, 17° N. Lat., i.e., + 746 seconds.
Total of the corrections (2) and (3) is + 425 + 746 = + 1171 seconds = $\frac{1171}{24}$ or 49 vināḍis.

N.B.—Corrections (2)+(3) are sufficient for determining local sunrise: in this case the result "+49 vināḍis" means that on the day in question the sun rose at Ratnagiri 49 vināḍis or 20 minutes before 6 a.m. [Result arrived at by Professor Jacobi, 50 vināḍis which is also 20 minutes of time.]

(ii) Kaliyuga 4325, 4 Mārgaśīrsha (Bengal solar month), SRINAGAR, latitude 34°. Correction (1): − 8 vināḍis (We do not use this correction.)
Correction (2): + 437 seconds (220th day).
Correction (3): For $220 + \frac{4325-3740}{64} = 220 + \frac{585}{64} = 220 + 9 = 229$ days, the correction is = 2248 seconds.
Total of corrections (2) and (3): + 437 − 2248 sec. = — 1811 seconds = — 75 vināḍis. [Professor Jacobi arrives at the result — 74 vināḍis.]

(iii) Kaliyuga 4128; 7 Jyēshṭha (Bengal solar month); ALIGARH, latitude 28°
Correction (1), + 14 vināḍis. (We do not use this correction.)
Correction (2), — 291 seconds (37th day).
Correction (3), + 2576 seconds (43rd day).
Total of corrections (2)+(3): + 2285″ = 95 vināḍis (94 vināḍis according to Professor Jacobi).

(iv) Kaliyuga 3585; Āshāḍha *śukla* 12 (lunar month), ERAN, 24° N. Lat.
See paragraph 207, page 86 below.

119. The reader should note carefully when the total of all the *three* corrections should be used and when the total of corrections (1) and (3) will suffice. When we merely want to know by how many seconds *local* sunrise preceded or followed 6 a.m., we should simply add up the second and third corrections, for here there is no need to consider the effect of terrestrial longitude. If the total correction is positive, sunrise precedes 6 a.m.; if the total correction is negative, sunrise is later than 6 a.m. The first three examples above illustrate this aspect of the problem.

When we want to know how many seconds should be added or deducted from the ending moment of a *tithi* or *nakshatra*, of which we already know the Lankā time, i.e., the time relatively to Lankā sunrise, we should sum up all *three* corrections, and if the sum is positive we should add it to Lankā time, while if the sum is negative it should be subtracted from Lankā time.

SECTION XIII.—*Lagna.*

120. Closely analogous to the calculation of sunrise is that of the *lagna*, i.e., the portion of the ecliptic which appears at the eastern horizon at a *particular moment of the day*. At other times we might require to know the moment of the day when a *particular portion of the ecliptic* will be *lagna*. An example of the first kind of problem is—

"What is the lagna at the moment of a person's birth"?

N.B.—The portion of the ecliptic which is *lagna* or "cut" at the horizon at any given moment is ordinarily referred to as "the *lagna*."

An example of the second problem is—

"At what moment of a day, suitable for marriage, will a particular sign of the zodiac be lagna, so that the hour as well as the day most suitable for marriage may be determined"?

The best exposition of the lagna is that given by Professor Jacobi at pages 189, 190 of the *Indian Antiquary* for 1900, Volume XXIX. A slight adaptation of Professor Jacobi's rules will be necessary to suit our sunrise Table III.

121. The Rules are—

(1) Calculate the time-difference for the interval of space between the sum and the portion of the ecliptic which is lagna.

(2) Apply the necessary corrections for tropical longitude.

122. *Problem I.*—At how many *ghaṭikas* and *palas* after sunrise was the 165th degree of the ecliptic (i.e., the 15th degree of the sign *Kanyā*,—vide Eye-Table z) *lagna* on the 6th Jyēshṭha (Bengal solar month) in Kaliyuga 4000, Latitude 20° North? By Eye-table a the end of 6th solar *Jyēshṭha* was 30·93 + 6 = 36·93 days or nearly 37 days from the first moment of the solar year A.D. 899—900.

Now, the sidereal longitude at sunrise on any day of the solar year is found from Tables IV-C and IV-D thus—

Sun's actual Long. for 37 days of the solar year (Table IV-C)	34·32° + 1·49 = 35·82°
Deduct Sun's Long. for ·60 day (Table IV-D)	·59°
	35·23°

N.B.—We deduct ·60 on account of the commencement of the solar year according to Table II *Sūrya siddhānta*.

For the present purpose we take the nearest whole degree, i.e., 35 degrees.

The interval in space between 35° and 165°=130°.

Now 360 degrees of the ecliptic rise above the horizon in 1 day or 60 ghaṭikas.

$\therefore$ 130 degrees ... ... $\frac{130 \times 60}{360} = 21\frac{2}{3}$ ghaṭikas

= 21 ghaṭikas 40 palas.

In other words, the 165th degree of the ecliptic was *lagna* about 21 ghaṭikas 40 palas after sunrise on the day in question.

123. Next, we proceed to apply the corrections for tropical longitude.

The difference between the tropical and sidereal longitude of the sun for the year Kaliyuga 4000 $= \frac{4000-3740}{64} = 4$ days. Now 36·93 days + 4 days = 40·93 days.

The correction for the tropical longitude of the sun is that pertaining to the 41st day in Table III, under latitude 20°, i.e., +1865 seconds.

For the correction for tropical longitude of the lagna, i.e., sidereal 165° of the ecliptic in Kaliyuga 4000 we have to determine the day when the mean sun accomplishes 165° of the ecliptic, which is determined as follows from Tables IV-C and IV-D :—

(Table IV-C) 169 days =	164·43°
(Table IV-D) ·5° day =	·57°
169·58 days =	165°

We add 4 days to 169·58 days for tropical longitude in the year Kaliyuga 4000. Total 173·58 or 174 days.

The correction for tropical longitude corresponding (in Kaliyuga 4000) to sidereal 165°, or tropical 174 days, is + 151 seconds.

We add this correction *with the sign reversed* to the first :—

+1865−151 = 1714 seconds = 72 palas.

Adding this correction to the approximation first arrived at, we have

21 ghaṭikas 40 palas.
+ 1 ghaṭika 12 palas
22 ghaṭikas 52 palas.

This was the moment (according to Professor Jacobi, *loc. cit.*) when the 165th degree of the ecliptic was *lagna* on the day in question.

N.B.—Firstly, we had to convert 165° of the ecliptic into days in order to apply Table III, which expresses the various portions of the ecliptic as days of the solar year.

Secondly, we reversed the sign of the correction in the case of the *lagna* because what we wanted was the difference between the corrections on account of the tropical longitude of the sun and of the *lagna* respectively.

124. *Second Problem.*—"What portion of the ecliptic was *lagna* on the same day at 20 ghaṭikas after sunrise?"

We have seen that sunrise on the solar 6th Jyēshṭhā corresponds to 35° sidereal longitude.

Now, a time-difference of 20 ghaṭikas answers to an interval in space of $20 \times \frac{360}{60} = 120$ degrees.

∴ The portion of the ecliptic which was lagna at 20 ghaṭikas after sunrise was (*roughly*) 120°+35°=155° or the 5th degree of the 6th sign *Kanyā* (vide Eye-table for the longitude corresponding to the different rāśis).

This is enough for all ordinary calculations of lagna.

If we wish to be quite accurate, we proceed as follows. The correction for tropical longitude of the sun on the day in question was, as we have seen, +1865 seconds.

The correction for the tropical longitude of the *lagna*, i.e., 155° of the ecliptic must be found by applying Tables IV-C and IV-D.

(Table IV-C) 159 days = 154·57°
(Table IV-D) ·44 day = ·43°

159·44 days = 155·00°
Add for tropical longitude 4 days

163·44 days.

The correction for tropical longitude pertaining to the 20th degree of latitude and the 163rd day (in Kaliyuga 4000) is (by Table III)+333 seconds.

We add this *with sign reversed* to the first correction:

+1865—333 = +1532 = 64 palas.

In other words, on the day in question, the 155th degree of the ecliptic was lagna at 20 ghaṭikas *plus* 64 palas.

We want, however, the degree of the ecliptic which was *lagna* at exactly 20 ghaṭikas after sunrise.

125. The annexed small table adapted from Prof. Jacobi's Table of *udayāsus* in Vol. I, *Ep. Ind.*, enables us to accomplish this stage of the problem.

We learn from this table that in the 20th degree of latitude the 6th sign of the zodiac (Kanyā, with which we are concerned) takes 257 seconds to rise *one* degree above the horizon.

∴ 64 palas or 1532 seconds are taken to rise $\frac{1532}{257} = 5{\cdot}9611°$

or (by Table VI) 5 degrees 57 minutes 40 seconds,
or nearly 5 degrees 58 minutes.

In other words, we should deduct 5 degrees 58 minutes from 155° in order to know which portion of the ecliptic was *lagna* at exactly 20 ghaṭikas after sunrise on the day in question.

The portion in question was 155° *minus* 5 degrees 58 minutes = 149 degrees 2 minutes, which is exactly the result arrived at by Professor Jacobi.

Time (in seconds) taken by a degree of the ecliptic to rise above the horizon.

DEGREES OF TERRESTRIAL LATITUDE FROM 8° TO 35°.

Signs of the zodiac.	Degrees of ecliptic.			8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°	20°	21°
I	0°— 30°	XII	330°—360°	210	208	206	204	202	201	199	197	195	194	192	190	188	186
II	30 — 60	XI	300 —330	229	227	226	224	223	221	220	218	217	215	214	212	211	206
III	60 — 90	X	270 —300	253	253	252	252	251	251	250	250	249	248	248	247	246	249
IV	90 —120	IX	240 —270	263	263	264	264	265	266	266	267	267	268	269	269	270	270
V	120 —150	VIII	210 —240	250	251	253	254	256	257	259	260	262	263	265	266	268	269
VI	150 —180	VII	180 —210	238	238	239	241	243	244	246	248	250	252	254	255	257	259
Signs of the zodiac.	**Degrees of ecliptic.**			**22°**	**23°**	**24°**	**25°**	**26°**	**27°**	**28°**	**29°**	**30°**	**31°**	**32°**	**33°**	**34°**	**35°**
I	0°— 30°	XII	330°—360°	184	182	180	178	176	174	172	170	168	165	163	161	159	157
II	30 — 60	XI	300 —330	208	206	205	203	201	199	197	196	194	192	190	188	186	184
III	60 — 90	X	270 —300	245	244	244	243	242	242	241	240	239	238	238	237	237	236
IV	90 —120	IX	240 —270	271	273	273	274	274	275	275	276	277	277	278	278	279	280
V	120 —150	VIII	210 —240	270	272	274	276	278	279	281	283	285	287	289	291	293	295
VI	150 —180	VII	180 —210	261	263	265	267	269	271	273	275	278	280	282	284	286	288

126. The operation of determining the *lagna* of a particular moment (e.g., the moment of a birth), or the moment when a particular degree of the zodiac will be *lagna* (say, to make an auspicious marriage) has to be performed occasionally not only by the astrologer, but also by the enquirer who wishes to verify a statement in a time-record as to *lagna*. The rules on this subject given above are adapted from Prof. Jacobi's original article in the *Indian Antiquary*. For rapid working the following formulæ may be found useful. Let—

A = Sun's longitude at 6 a.m. (Lanka).

B = interval in decimals of a day between local sunrise and actual *local* time of birth or other moment. This interval may, for practical purposes, be taken also as the change of sun's longitude corresponding to that interval; see N.B. to process (7) in first example below.

a = seconds per degree of rise (according to table supra).

T.L.S. = correction in seconds (Table III) for tropical longitude of sun at actual local sunrise.

T.L.L. = correction in seconds (Table III) for tropical longitude of approximate degree of lagna.

The approximate degree, which is lagna, = (A — B) + (B × 360°) or (A + 359 B) degrees.

The formula A + 359 B, process (11) below, is convenient for readily ascertaining the approximate lagna; and when the figure so obtained is well within a rāśi, it will be unnecessary to proceed further. For exact calculation, and when lagna is on the borders of a rāśi, we have,

$$\text{Actual lagna} = A + 359\,B^\circ - \frac{\text{T.L.S.} - \text{T.L.L.}}{a}$$

In order to render quite easy the performance of this operation, we shall exhibit, in detail and by means of an example, the 16 processes of which the operation consists. We propose to find the lagna of a child born at Madras at 12 noon (Standard or Indian Railway time) on 1st April 1915.

Process.	*Application.*
(1) Interval from actual local sunrise to moment of birth.	(1) The time (12 noon, standard time) should be reduced by 9 minutes for all dates subsequent to 1st July 1906, the date of introduction of *Indian standard*, or *Railway time* which is in advance of *Madras mean astronomical time* by 9 minutes. The mean astronomical time of birth was 11 hours 51 minutes after midnight; or 5 hours 51 minutes or ·2437 of a day after mean Madras sunrise. To this should be added, by Table III (for lat. 13°) *minus* 422 seconds for equation of time *plus* 351 seconds for tropical longitude = — 71 seconds = —·0007 of a day. (*N.B.*—In order to find the tropical longitude

Process. *Application.*

(2) Interval from Lankā sunrise to moment of birth.

for any day of the solar year for the present time, from A.D. 1840 to A.D. 1920—we should add 20 days to the number of elapsed days in the solar year and find under the given latitude in Table III the correction for tropical longitude appropriate to the resulting number of days.) The interval from actual Madras sunrise up to moment of birth was therefore 5 hours 51 minutes less 71 seconds = ·2430 of a day.

This is obtained by subtracting from 5 hours 51 minutes (the given interval), the time difference due to Ujjain longitude of Madras, i.e., 18 minutes; (2) will then be 5 hours 33 minutes = ·2312 of a day.

(3) Change of sun's longitude corresponding to (1) "interval from actual sunrise to moment of birth"; use Table IV-D.

The change of sun's longitude corresponding to ·2430 of a day is (by Table IV-D of this work) ·2365 + ·0030 = ·2395 of a degree.

(4) Change of sun's longitude corresponding to (2) "interval from Lankā sunrise to moment of birth"; use Table IV-D.

The change of sun's longitude corresponding to ·2312 of a day is (by Table IV-D) ·2267 + ·0012 = ·2279 of a degree.

N.B.—Processes (3) end (4) may generally be dispensed with. See *N.B.* to (7) below.

(5) Days and fraction of a day (Lanka time) elapsed in solar year up to moment of birth.

Take the given day of the English year (1st April) as reckoned from previous 1st April (Eye-table, section q) and deduct the day and fraction of day in April when the solar year 1914–15 commenced, according to Table II, i.e., April 12·2430. The given English day, April 1st, A.D. 1915, is, by Eye-table q, the 366th day reckoned from previous 1st April. Now, 366·2312 *minus* 13·2430 days = 352·9882 days.

(6) Longitude of sun at moment of birth.

N.B.—This is the *absolute* longitude of the sun for the moment of birth and does not depend on Lankā or any other time, though it is deduced by means of Lankā time.

By Table IV-C, the mean longitude of sun for 352 days of the solar year is 344·7927°
Equation of centre for 352 days of the solar year = + 2·1717°
Longitude of sun corresponding to ·98 of day = ·9659°
Longitude of sun corresponding to ·0082 of day = ·0081°

Longitude of sun corresponding to 352·9882 days = 347·9384°

(7) Longitude of sun at actual local sunrise.

To obtain this, we simply subtract (3) from (6); or we shall have equally correct results by subtracting (1) from (6).

N.B.—We see that we might equally well take (1) instead of (3), and in general a fraction of a day less than unity may be used equally well as the change of sun's longitude corresponding to that fraction of day, since the sun's motion per day is nearly 1°.

347·9 *minus* ·2° = 347·70.

(8) Add to (7) as many minutes of an arc as there are years since A.D. 532 and deduct 360° if necessary. This is the addition for luni-solar precession—see Paper (ii) in Appendix; also paragraph 229, page 94 below. The exact figure according to paragraph 229 is 22·5°, but the difference between this and 23·05°, viz., ·5° does not affect process (9).

1,915 − 532 = 1,383 minutes = 23 degrees 3 minutes = 23·05°:
347·7° + 23·05 = 370·75°
− 360°
10·75°

Process.	*Application.*
(9) Convert (8) into days by Table IV-E. Deduct 365·26 days *if necessary*.	10 degrees = 10·15 days. ·75 degree = ·76 day 10·8° = 10·91 days.
(10) Correction for tropical longitude of sun (Table III) appropriate to latitude of given place (Madras, lat. 13°) and days arrived at in (9).	+ 428 seconds of time.
(11) Approximate lagna :— Add the figure in (6) to 359 times the figure in (3) and deduct 360° *if necessary*.	347·9° + 359 × ·2395° = 433·9° — 360° 73·9°
(12) Add to (11) same quantity as in (8) and convert result into days by Table IV-E. Deduct 365·26 days *if necessary*.	73·9° + 23·05° = 96·95° = 98·37 days (by Table IV-E, for 90 degrees = 91·32 days. 6 degrees = 6·00 days. ·95° or 57 min. = ·96 day. 97·0° = 98·37 days.
(13) Correction for tropical longitude of approximate lagna (Table III) appropriate to latitude of given place (Madras, lat. 13°) and days arrived at in (12).	+ 1,217 seconds.
(14) From (10) deduct (13) algebraically.	+ 428 — 1,217 = — 789 seconds.
(15) Divide (14) by figure under latitude of given place in the table on page 44 and against sign of zodiac corresponding to degrees in (12).	Sign of zodiac corresponding to 97·0° of tropical longitude is IV. The figure against sign IV and under lat. 13° in the table on page 44 *supra* is 266 seconds. Now $\frac{-789}{266} = -3$ (approximately).
(16) Actual lagna is (11) *minus* (15) subtracted *algebraically*.	73·9° — (— 3°) = 76·9° or **17° in Mithuna rāśi**.

The above example is suited to a case in which the moment of birth is recorded in Indian Standard Time. But supposing the birth we are considering took place at 12 noon, Standard Time, on 1st April 1915 at *Vizagapatam*, where the same time is kept as at Madras, then in order to complete process (1) above, i.e., to ascertain the interval between actual local sunrise and time of birth, we should increase or decrease the interval by the difference in time between the Ujjain longitude of Madras and that of Vizagapatam as given in Table III. The interval will then be diminished by 1,804 — 1,072 = 732 seconds = 12 minutes, 12 seconds = (by Table VI) ·0084 of a day.

If, on the other hand, strict Indian usage has been followed (which is nowhere done at present, except by extra careful astrologers), and the moment of birth has been recorded as so many ghaṭikas and palas after *actual local sunrise*, this is the very thing we want for process (1), and we need not trouble to calculate it.

127. We shall now indicate the processes for the converse problem of ascertaining the rising moment of a lagna, considered suitable for an act depending on the human will, say, the performance of a marriage, the undertaking of a journey, the taking charge of a house or an appointment, etc. The processes are only ten in number. Suppose we want to fix a suitable hour so as to have a marriage, etc., performed at Vellore (lat. 13°, time diff. + 808 seconds) on 15th May 1915, in the middle of Siṁha lagna (135° sidereal longitude), then we proceed as follows :—

(1) Find longitude of sun at Laṅkā mean sunrise on the given day. Proceed as in the first example.	26·° + ·2 × 9·8° + 1·6° + ·4° = 26·6° + 1·96° + 1·6° + ·4° = 30·56°.
(2) Find out by how much local sunrise precedes or follows Ujjain sunrise. (Table III, lat. 13°, 33rd day for equation of time; 33 + 20 or 53rd day for tropical longitude.)	May 15th is the 33rd day of the Indian solar year at the present epoch. According to Table III the total correction for any moment at Vellore is — 348 + 1,592 + 808

Process.	*Application.*
	seconds = 2,052 seconds = 34 minutes 12 seconds = + ·0240 of a day. That is local sunrise precedes Lankā mean sunrise by ·0240 of a day.

N.B.—In section 119 supra it is stated that "when we merely want to know by how many seconds local sunrise preceded or followed 6 a.m., we should simply add up the second and third corrections." By 6 a.m. in this passage is meant (according to strict Indian usage) local 6 a.m., i.e., 6 a.m. by a clock keeping mean astronomical time *for the locality in question*. (There is no such clock at present, except at astronomical observatories.) In the present case we want to know more, we want to know by how many seconds or minutes sunrise at Vellore on 15th May 1915 preceded or followed *Ujjain or Lankā* 6 a.m. We have in this case to take into account the first correction also, namely, that for terrestrial longitude, and we have done so in the above working. Again we took in the present case the correction for tropical longitude corresponding to the 53rd day of the year. The correct day, as shown in process (8) below, is the 52nd, but the difference will not lead to any appreciable error.

(3) Deduct (2) from (1) *algebraically* ... This is the longitude of the sun at actual local sunrise at Vellore on 15th May 1915.	30·56° − (+ ·024°) = 30·52°.
(4) Deduct (3) from proposed lagna, increasing the latter, *if necessary*, by 360°.	135° *minus* 30·52° = 104·48.
(5) Time of approximate lagna. Divide (4) by 360.	$\frac{104·48}{360}$ = ·2902 of a day. = 17 ghaṭikas 25 palas, or 6 hours 58 minutes after local sunrise at Vellore.
(6) Increase (3) by 23·1° for tropical longitude as in process (8) in the first example, and convert into days by Table IV-E.	30·52° + 23·1° = 53·62 degrees. 50 degrees = 50·73 days. 3 „ = 3·0 days. ·6 „ = ·61 day. 53·6 degrees = 54·34 days.
(7) Increase (4) by 23·1° for tropical longitude of proposed lagna and convert into days by Table IV-E.	104·48° + 23·1° = 127·6°. 100 degrees = 101·5 days. 20 „ = 20·3 „ 7 „ = 7·1 „ ·6 „ = ·6 day. 127·6 degrees = 129·5 days.
(8) Find from Table III for given latitude (Vellore 13°) the correction for tropical longitude appropriate to (6).	+ 1,610 seconds.
(9) Find from Table III for given latitude (Vellore 13°) the correction for tropical longitude of lagna, i.e. (7).	+ 518 seconds.
(10) The actual moment of rising of the proposed lagna is {(9) *minus* (7)} added algebraically to (5).	(5) (9) − (7) 6 hrs. 58 min. + 518 sec. − 1,610 sec. = 6 hrs. 58 min. less 1,092 sec. = 6 hrs. 58 min. less 18 min. 12 sec. = 6 hrs. 39 min. 48 sec. = ·2776 of a day (Table VI). By Table VI, this fraction = 16 ghaṭikas 39 palas after local sunrise at Vellore. This was the moment suitable, *cæteris paribus*, for a marriage to be celebrated under *Siṁha* lagna (135°) at Vellore on 15th May 1915.

Section xiv.—*Sunset.*

128. The considerations to which we have introduced the reader in dealing with sunrise and lagna will enable him to deal also with *sunset*, which is only the supplement (in the language of geometry) of *sunrise*.

Supposing the sun is at a point of the ecliptic whose tropical longitude is 100°, then we have to consider at sunrise how long, relatively to the mean sun on the equator, the mean sun on the ecliptic takes to rise 100°, and at sunset we have to consider how long, relatively to the mean sun on the equator, the mean sun on the ecliptic takes to fall 80°.

129. Accordingly, to determine the moment of sunset by local time, we should take the sum of (1) the correction for equation of time, which is the same or

nearly the same as for sunrise, and (2) the correction for tropical longitude, which will be the supplement of the tropical longitude for sunrise. The supplement of an angle is the difference between it and 180°. In our sunrise tables, degrees are expressed as days and by Tables IV-C and IV-D 180°=184·80 days or in round figures 185 days.

130. What we have to do, therefore, to determine the second correction for sunset is to find the difference between the day of the solar year under consideration and 185 days, and take the correction for tropical longitude for the day so arrived at. If the solar day we are considering exceeds 185 days, the sign of the tropical longitude for the difference will remain unchanged: otherwise the sign should be reversed. This correction should then be added to the equation of time in order to determine the interval between sunset and 6 p.m. local time, while the total so arrived at should be added again to correction (1) adverted to in paragraph 113, i.e., the correction for terrestrial longitude, in order to arrive at the interval between 6 p.m. *Lankā* time and *local* sunset.

131. In the absence of any other standard authorities on the subject, we may compare our calculations of sunset for A.D. 1910–11 with those given in the Kumbakōnam Mutt Panchāngam, edited by Mr. Viśwanātha Śrauti, B.A.

Latitude 11° *N.* (*Tanjore*).

Date by European Calendar as well as by Tamil solar year *Sadharana* A.D. 1910.	Days of solar year according to Table III	Equation of time in seconds by Tab. III under Lat. 11° for the day for solar year entered in col. (2).	Supplement to trop. longitude in days (i.e., difference between col. (2) increased by 20 and 185 days).	Correction for trop. longitude acc. to Tab. III for the supplemental day arrived at in column (4) (*sign to be reversed if necessary*).	Sum of corrections arrived at in columns (3) and (5).	Moment of sunset according to col. (3).	Sunset according to Mr. Srauti's panchangam for 1910.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
						P.M.	P.M.
Chittirai 1 (Ap. 13)	1	−435″	164th day	− 22″	− 457″=− 7′	6-7	6-7
Vaigāśi 2 (May 15)	32	−352″	133rd day	− 312″	− 664″=−11′	6-11	6-11
Āni 3 (Je. 16)	65	−147″	100th day	− 986″	−1133″=−19′	6-19	6-19
Ādi 3 (Jl. 18)	97	+163″	68th day	−1469″	−1306″=−22′	6-22	6-23
Āvaṇi 4 (Au. 19)	129	+411″	36th day	−1168″	− 757″=−13′	6-13	6-14
Puraṭṭāśi 5 (S. 20)	161	+515″	4th day	− 144″	+ 371″=+ 6′	5-54	5-55
Aippaśi 6 (O. 22)	192	+494″	27th day (212−185=27)	+ 969″	+1463″=+24′	5-36	5-36
Kārttigai 8 (N. 23) ...	224	+353″	59th day	+1528″	+1876″=+31′	5-29	5-30
Mārgaḷi 3 (D. 17)	249	+140″	84th day	+1278″	+1418″=+23′	5-37	5-37
Tai 21 (F. 3) A.D. 1911 ...	296	−268″	133rd day	+ 312″	+ 44″=+ 1′	5-59	6-1
Paṅguni 2 (Mr. 15) A.D. 1911	337	−421″	172nd day	+ 12″	− 409″=− 7′	6-7	6-8

132. We observe (1) that sufficiently accurate results can be obtained by taking whole days instead of days and fractions of days in columns 2 and 4 supra; in other words, it is not necessary to calculate the day of the solar year with exactitude as we did for Problem I under "*Lagna*," (2) that a *positive* correction in column 6 re-appears in column 7 as a *deduction* from 6 p.m., while a *negative* correction in column 6 re-appears in column 7 as an addition to 6 p.m.

Supposing a birth took place 2 hours after sunset on 13th April 1910, the moment of birth would be 6 p.m. + 2 hours + 7′ =8–7 p.m. In this case sunset was 6–7 p.m. On the other hand, if a birth took place 2 hours after sunset on 23rd November 1910, then the correction for sunset being + 31′, the local time at which the birth took place would be 6 p.m. + 2 hrs.−31′ = 7–29 p.m. In this case sunset was at 5–29 p.m.

SECTION XV.—*Eclipses.*

133. Eclipses are a most valuable and unerring historical record, and eclipses are freely cited in Indian historical documents. Accordingly, the date of occurrence of solar and lunar eclipses has been indicated in Table II and throughout this Ephemeris by means of the symbol ● for solar eclipses and ○ for lunar eclipses. A solar eclipse can occur only at new moon and a lunar eclipse can occur only at full moon, and as full moons are not specially indicated in Table II, every lunar eclipse is there shown merely as occurring in a particular lunar month. The actual date of a lunar eclipse can be found by working out the exact ending moment of the full-moon tithi, i.e., *panchadasī* or *paurnamī*. For this, of course, it will be necessary to add the collective duration of fifteen tithis, i.e., 14·76 days (Eye-table), to the mean moment of new moon and also to the moon's and sun's anomaly at that moment and add to, or subtract from, the mean moment of full moon the sum of the sun's and moon's equations. (See examples worked out in section 96 and Eye-table.) In the body of the Ephemeris, every eclipse, whether solar or lunar, is marked against the very day on which it occurred.

134. We may preface our observations on eclipses by the following passages from a well-known French work, first published in the 18th century, and still regarded as a standard authority on chronology, "*L'art de vérifier les dates*":—

"The magnitude of an eclipse is indicated in digits. A digit is the twelfth part of the diameter of a heavenly body: accordingly, an eclipse of four digits is one where the third part of the diameter of a heavenly body is in shadow; if one half of the diameter is in shadow, the eclipse is said to be of six digits; and if the whole of the diameter is in shadow, the eclipse is said to be of twelve digits. Further, in a total eclipse, if the part which is least in shadow is removed from the edge of the shadow by as much as two digits, these two digits are added to the twelve, and the eclipse is said to be one of fourteen digits.

135. "The duration of an eclipse of the moon is proportional to its magnitude; but it does not depend on this factor alone. We may say, in general, that a total eclipse of the moon will last at least $3\frac{1}{2}$ hours, and at most 4 hours and a few minutes. A partial eclipse above six digits may last as much as $3\frac{1}{4}$ hours or as little as $2\frac{1}{2}$ hours; it seldom goes beyond these limits. An eclipse of between three and six digits lasts between two and three hours. The duration corresponding to two digits is $1\frac{1}{2}$ hours; to one digit, one hour; to half a digit, $\frac{3}{4}$ of an hour. The duration of total obscurity in a total eclipse is from $1\frac{1}{2}$ to 2 hours.

136. "The moon has no light of her own, but reflects that received by her from the sun. Consequently, when in an eclipse the earth passes between the moon and the sun, and cuts off the rays of the sun from the moon, the latter can shed no more light on Paris than on Pekin or on Constantinople. An eclipse of the moon, therefore, commences at all points of the earth at the same instant and lasts everywhere for the same length of time. All that we need see is whether the time of a lunar eclipse falls between local sunset and sunrise, as otherwise the eclipse will not be visible.

137. "On the other hand, the sun is a self-luminous body: the moon is very much smaller than the earth: she is, in fact, a mere point in comparison with the sun. From these well-known facts it follows that in a solar eclipse, the moon passing between the earth and the sun, cannot cut off the rays of the sun from all parts of the earth, at the same instant. She casts her shadow in succession on different parts of the earth, and even the successive passage of the moon's shadow covers during a single eclipse only a small total extent of the earth's surface. Thus, journeying from west to east, a solar eclipse may first strike Spain, then France, then Germany, and then in succession the eastern countries as far as the farthest east of Asia, but the whole time Africa may remain untouched by the moon's shadow."

138. The extent of the earth's surface, affected by a solar eclipse, is therefore a matter of calculation: and an exact calculation is by no means easy to introduce into a popular work of this kind.

The book entitled *L'art de vérifier les dates* gives (1) *all* lunar eclipses and (2) *all* solar eclipses visible anywhere in the civilized world known to history, marking, by a series of ingenious conventions, the path of each solar eclipse, the regions where it is visible and the latitudes where it is central (*a*) under the fifth meridian, i.e., on the Coast of West Africa, 15° of longitude west of Paris, (*b*) under the meridian where it is noon at the moment of true conjunction, and (*c*) under the 155th meridian, i.e., in 142° longitude east of Greenwich. Other useful details, given under each eclipse, in the same valuable work, need not be reproduced here, as nothing short of a translation of the whole chapter on eclipses would give the reader an adequate idea of its contents.

139. Table II and the body of the Ephemeris exhibit *all* lunar eclipses, and it is easy for the reader to calculate the ending moment of the full moon tithi, which will enable him to know whether the eclipse could have been seen in India at the place under consideration. Likewise *all* solar eclipses have been given as in the French work, from A.D. 1 to A.D. 300, and after the latter date as a rule, eclipses which, according to the same authority, could not have been visible in India are not mentioned.

140. The points where the moon's orbit crosses the ecliptic are called the *nodes* and in order that an eclipse may occur, the opposition at the time of a lunar eclipse, or the conjunction at the time of a solar eclipse, must happen at or near a node. The sun's distance from either node is therefore an important factor in determining whether an eclipse is or is not possible at a particular new or full moon. Sun's longitude Tables IV-C, IV-D and IV-E and Rāhu tables (IV-K) for centuries and odd years will enable the reader to calculate the sun's distance from either node (Rāhu is simply the Indian name for the moon's ascending node) at any moment from 1 B.C. to A.D. 2000, and by applying the following canons (adapted from Professor Jacobi's article in Volume 1 of *Epigraphia Indica*) he may determine whether a solar or a lunar eclipse is certain, doubtful, or impossible at a particular new or full moon respectively.

Solar and lunar eclipses as determined by sun's distance from node at new and full moon —

If sun's distance from node at new moon is

Between 0° and 16·2°, or between 163·8° and 180°	A SOLAR ECLIPSE IS	*Certain.*
Between 16·3° and 18·9°, or between 161·7° and 161·1°		*Doubtful.*
Between 19·0° and 161·0°		*Impossible.*

If sun's distance from node at full moon is

Between 0° and 10·44°, or between 169·56° and 180°	A LUNAR ECLIPSE IS	*Certain.*
Between 10·45° and 13·86°, or between 169·55° and 166·14°		*Doubtful.*
Between 13·87° and 166·13°		*Impossible.*

These canons are exhaustively dealt with in Chapter V, Section v, pages 134 to 150 and in Table IV-L of this work.

N.B.—For all solar and lunar eclipses in the years B.C. 1207 to A.D. 2000, the standard work of reference is *Oppolzer's Kanon der Finsternisse* (*Order of eclipses*): and it may be safely asserted that there are no trustworthy references in any literature in the world to eclipses of an earlier date than B.C. 1207. An attempt to expound the manner in which eclipses are calculated is, therefore, of little practical use in chronological investigation when the answer to the questions whether an eclipse was possible, and in which regions of the earth a solar eclipse was visible, may be easily obtained from Oppolzer. But occasionally one has to satisfy the public curiosity as to whether there was an eclipse on a date earlier than B.C. 1200. To the extent necessary to satisfy such curiosity, the author has furnished in Chapter V, Section v (pages 134 to 150) and in Table IV-L of the present work certain cycles of recurrence of eclipses, not hitherto generally noticed, whereby the occurrence of an eclipse in a past year, however remote, may be verified by the application of certain simple tests.

SECTION XVI.—*Jovian cycles, years and months.*

Note.—For the exact calculation of Jupiter's mean or actual place at any moment see Tables V-A and V-B and the explanation of them in Chapter V *infra*.

141. A Jovian year is the period taken by Jupiter to pass through a sign of the zodiac, 30 degrees and it is somewhat less than an Indian solar year. A Jupiter's

cycle of 60 Jovian years is often met with in Indian chronology as a mode of reckoning time. Each of the years in the cycle receives a name corresponding to the name of one of the years in Table I, but while the so-called Jupiter's cycle in Table I, as used to this day in Southern India, is merely a cycle of 60 Indian solar years, the Jupiter's cycle, properly so called, which has been in use in Northern India and which is also given in Table I, is a cycle of real Jovian years.

142. Altogether three different meanings might be attached to the citation of a year of Jupiter's cycle:—

(1) A year of the southern cycle (Table I), which is merely a solar year with a Jovian *name*.

(2) A year of the northern cycle (Table I), which is the Jovian year actually completed at the *beginning* of a solar year.

(3) A year of the northern cycle (Table I), being the Jovian year actually completed at the actual *moment* we are dealing with.

The context alone must enable us to conjecture which of these meanings is to be attached to a citation of a Jovian year.

143. Also, where the second of the three modes of citation is followed, it is evident that if any other Jovian year has had its beginning *as well as its end* in the course of a solar year, that Jovian year will be *kshaya* or suppressed.

Hence it is that certain Jovian years are actually suppressed in the northern system of reckoning. The suppressed years are shown by blanks (.....) in Table I, northern cycle.

144. *Fourth mode of citation* (4).—There is a fourth mode of citation of Jovian years which we often find in Malayālam inscriptions, and that is to cite, instead of one year out of every sixty, one year out of every twelve. In twelve Jovian years the planet Jupiter passes through the twelve signs of the zodiac and each sign corresponds to one of the twelve years of Jupiter's revolution. In a case in which Jupiter had completed nine Jovian years *, he would be described as being in the 10th sign of the zodiac, i.e., *in Makara*.

145. *Fifth mode of citation* (5).—In this the twelve Jovian years receive the names of the twelve lunar months, *Kārttika* being the first and *Aśvina* the 12th. The Jovian years † (properly, months) are distinguished from lunar months by the prefix *Mahā*. Thus, Mahā-Kārttika, Mahā-Mārgaśira, etc.

146. *Sixth mode of citation* (6).—This is the heliacal rising system, in which the Jovian cycle begins with the heliacal rising of Jupiter, i.e., his re-appearance after a conjunction with the sun. The system is exhaustively dealt with by Mr. Dikshit in his introduction to Volume III of Dr. Fleet's *Corpus Inscriptionum Indicarum*, and all the citations of this kind, hitherto found in inscriptions, are there collected.

147. Readers in Southern India will be mainly interested in the 1st and 4th modes of citation, of which the latter is otherwise called the "mean-sign system" † and which is met with in Travancore inscriptions, e.g., those discussed by Dr. Schram in *Indian Antiquary*, Volume XXV (1896), pages 9—11; and by Professor Kielhorn at pages 53, 174 *ibid*.

We shall cite an example: "Kollam 390, Jupiter in Kumbha, and the sun 18 days old in Mīna, THURSDAY, Pushya nakshatra, 10th lunar day."

Kollam 390 is equivalent to A.D. 390 + 824 = A.D. 1214 (Indian solar year).

Eighteen days in Kumbha month means 352 days of the solar year—

			Degrees.
By Table IV Jupiter's mean longitude at beginning of A.D. 1200		was	220·10
"	" for 14 years	is	64·86
"	" for 352 days	is	29·25
	Total ...		314·21

* "Jovian year" does not mean the period of revolution of Jupiter's orbit (which is a little less than 12 solar years) but one-twelfth of that period, which is roughly equivalent to a solar year.

† In chapter V of this work which is devoted to planetary chronology, the reader will find a direct method of calculating either the mean or the actual sign or rāśi occupied by Jupiter at any moment.

Now 314° is the 14th degree of Kumbha rāśi. Therefore Jupiter is rightly described as having occupied Kumbha on the date in question. If we want Jupiter's actual geocentric place on this date we refer to Table V-A where we are informed that it was the same as on the corresponding solar day of A.D. 1819 less ·2°; and according to Table V-B this position was 316°.

SECTION XVII.—*The Varttamāna, Pūrṇimānta, Āmānta and Kārttikādi systems of citation.*

148. The ordinary or normal mode of citing an Indian date is by means of *gata* or 'expired' years, *amānta* months (or months beginning with the first tithi after new moon or *Amāvāsyā*), and *Chaitrādi* years (or lunar years beginning with *Chaitra*). The lunar year can begin with Chaitra only when the solar year begins with Mēsha Sankrānti. Therefore a reckoning by Chaitrādi lunar years is the same as reckoning by Mēshādi solar years.

149. Exceptional modes of citation, used at certain epochs of history, or still used in certain parts of India, are:—

Varttamāna, or current years, opposed to *gata* (expired); *Pūrṇimānta* months, beginning with the tithi after full moon; and *Kārttikādi* lunar years (or "southern" years) beginning with the lunar month *Kārttika*.

150. In the *Pūrṇimānta* system, each month beginning with a full moon is named after the next *amānta* month, but takes in the dark fortnight preceding each new moon. It is to this system that we owe the name *paksha*, lit. a wing, the dark and bright fortnights being the wings on either side of a new moon.

151. In the *Kārttikādi* lunar year system, the year beginning with lunar Kārttika takes the number of the Meshādi solar year then running, and has in common with it the five months, Lunar Kārttika to Lunar Phālguṇa.

Canons—

I. A *dark* fortnight in *n*th Amānta month is in $(n+1)$th *Pūrṇimānta* month.

II. Any month or tithi in *N*th year, expired, is in $(N+1)$th year *current*.

III. Any of the months named in the margin in *N*th year Chaitrādi, expired, is ascribed to the

(*a*) $(N-1)$th year *Kārttikādi, expired*, or to
(*b*) *N*th year, *Kārttikādi, current*.

Chaitra.
Jyēshṭha.
Āshāḍha.
Śrāvaṇa.
Bhādrapada.
Aśvina.

N.B.—Conversely, any of the above months in *n*th year *Kārttikādi*, expired, is ascribed to $(n+1)$th year *Chaitrādi*, expired.

For clearness' sake, we will present these three rules under three aspects, one of which, when we are in doubt, every problem before us must assume.

First aspect.—If we have before us a dark fortnight or *bahula* tithi of the *n*th month in the *N*th year, known to be an expired year, but do not know whether the system is *amānta* or *pūrṇimānta*, we must search for the tithi both in the *n*th and the $(n-1)$th month in our ordinary (Amānta) tables.

Second aspect.—If we have before us a dark fortnight or *bahula* tithi of the *n*th month in the *N*th year, and do not know whether the month is *amānta* or *pūrṇimānta*, nor whether the year is expired or current, we must, in using our tables, look for the tithi—

(1) in the *n*th month, *N*th year, expired;
(2) in the $(n-1)$th month, *N*th year, expired;
(3) in the *n*th month, $(N-1)$th year, expired; and
(4) in the $(n-1)$th month, $(N-1)$th year, expired.

Third aspect.—If we have before us a dark fortnight or *bahula* tithi of the *n*th month (from Chaitra to Aśvina, inclusive) in the *N*th year and do not know whether the month is *amānta* or *pūrṇimānta*, or whether the year is

expired or current, *Chaitrādi* or *Kārttikādi*, we must, in using our tables, look for the tithi—

(1) in the *n*th month, *N*th year, expired;
(2) in the $(n-1)$th month, *N*th year, expired;
(3) in the *n*th month, $(N-1)$th year, expired;
(4) in the $(n-1)$th month, $(N-1)$th year, expired;
(5) in the *n*th month, $(N+1)$th year, expired; and
(6) in the $(n-1)$th month, $(N+1)$th year, expired.

N.B.—For bright fortnight or *śukla* dates in any month, no search need be made in any case in the $(n-1)$th month; and whether for bright or dark fortnight dates in the months of Kārttika to Phālguṇa inclusive, no search need be made in any case in $(N+1)$th year, *expired*.

Readers who prefer Professor Kielhorn's mode of stating the same rules will find them in *Indian Antiquary*, Volume XIX, page 22, or at page 402 of *Epigraphia Indica*, Volume I. Any rules must be somewhat perplexing at first sight and should be carefully reasoned out by those interested in such investigations.

152. The lunar year beginning with lunar Chaitra of any solar year *n* is itself $(n+1)$. Thus, Chaitra 1265 may mean:—

(*a*) Lunar Chaitra at the end of current solar 1264, i.e., at the end of expired solar 1263.

(*b*) Lunar Chaitra at the end of expired solar 1264 and before the beginning of solar 1265 (expired).

(*c*) Lunar Chaitra at the end of expired solar 1265 and before the beginning of solar 1266 (expired).

This ambiguity is independent of the difference between Chaitrādi and Kārttikādi systems, and is peculiar to the lunar month Chaitra.

SECTION XVIII.—*The eras now in use or met with in inscriptions.*

153. In the following summary of Indian eras, adapted from Cunningham and other authorities, we give in each case the formula whereby a year of each era, "expired" or "current" as the case may be, may be obtained from the A.D. year, also noting where the era is or was in use, and whether it is amānta or pūrṇimānta, Chaitrādi or Kārttikādi and so forth.

(1) *Kaliyuga* (expired year=3102 *minus* B.C. year; A.D. year + 3101). Used all over India as a solar (Mēshādi) and luni-solar (Chaitrādi) year. The years in this era, with A.D., Śaka, and Vikrama equivalents, are indicated in Eye-table **k** from 3102 B.C. to A.D. 2000; and they are regularly given in the Ephemeris from A.D. 700 to A.D. 1999.

(2) *Saptaṛishi* (current year = A.D. year + 76). Mostly *current* and mostly *pūrnimānta* and *Chaitrādi*. At present in use in Kāshmir and formerly in Multan and elsewhere. Quoted generally in cycles of 100 years. Thus A.D. 1910 = Saptarshi 1986, current, quoted only as "86 Saptarshi, current." *

(3) *Vikrama era* (expired year = A.D. year + 57). Extensively used at present in Guzerat and all over Northern India, except Bengal: *Kārttikādi Amānta* in Guzerat, hence called *Southern Vikrama*; *Chaitrādi* and *Pūrṇimānta* in North India, hence called *Northern Vikrama*. Other names, "Malava era"; and also simply "Samvat." The Vikrama years, expired, from A.D. 500 to A.D. 2000 are regularly shown in Table II, and from A.D. 700 to A.D. 1999 in the Ephemeris.

(4) *Śaka era* (expired year = A.D. year *minus* 78). Extensively used in India both in the past, and at present. *Mēshādi* (for solar year) and *Chaitrādi* (for luni-solar year): generally *amānta*, but *pūrṇimānta* in Northern India. Śaka equivalents of Kaliyuga and Vikrama years, expired, from A.D. 500 to A.D. 2000, are regularly given in Table II, and from A.D. 700 to A.D. 1999 in the Ephemeris. Current śaka years are often quoted in inscriptions, in which case the formula is, current śaka = A.D. year *minus* 77.

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* The saptarishis are supposed (by an astronomical fiction) to occupy each nakshatra for 100 years; in other words they go round the circle of the nakshatras in 2,700 years. This convention is merely equivalent to our reckoning by centuries. Thus when Varāhamihira, quoting from Garga, says that the ṛishis were in Magha (nakshatra No. 10) during the reign of Yudhishtira, he means that the epoch was removed by 7 centuries from another when the ṛishis were in Kṛittikā nakshatra; and if we suppose that the astronomical fiction of the longitudes of all heavenly bodies being 0° at 0 day in 0 year Kaliyuga, was applied to the saptarishis also, and that their 0 longitude was in Krittika (which was an ancient reckoning), the epoch referred to by Varāhamihira would be *circa* 2500 B.C. to 2400 B.C., and Varahamihira's year-date for Yudhishtira's reign is actually A.D. 78—2526 years=2448 B.C. See Paper (v) in the appendix "Astronomical references in the Mahābhārata."

(5) *Kollam era* (current year = A.D. year *minus* 824). Used in Malabar, Cochin, and Travancore since A.D. 825. Begins in North Malabar with solar *Kanyā* and in South Malabar with *Chingam* (Siṁha); always *solar* and *current*. English equivalents for all Kollam years are regularly given in the Ephemeris.

(6) *Bengali san* (or *sen*) (current year = A.D. year *minus* 593). *Mēshādi, current solar year*. Now in use in Bengal. For A.D. 700 to A.D. 1999, B. san equivalents are regularly given in the Ephemeris, but they are given as expired years; and to find the current Bengal san, add one to the Ephemeris number.

(7) *Chedi* or *Kalachuri era* (current year = A.D. year *minus* 247), *current, Aśvinādi, pūrṇimānta*.

A.D.	300 =	Chedi	53 current.	A.D.	800 =	Chedi	553 current.
,,	400 =	,,	153 ,,	,,	900 =	,,	653 ,,
,,	500 =	,,	253 ,,	,,	1000 =	,,	753 ,,
,,	600 =	,,	353 ,,	,,	1100 =	,,	853 ,,
,,	700 =	,,	453 ,,	,,	1200 =	,,	953 ,,

Not now in use, but was in use under the Kalachuri kings in Western and Central India.

(8) *Gupta* (current year = A.D. year *minus* 319).

A.D.	400 =	Gupta	81 current.	A.D.	600 =	Gupta	281 current.
,,	500 =	,,	181 ,,	,,	700 =	,,	381 ,,

Not now in use. Was in use in Central India and Nepal in the centuries above indicated as *current, Chaitrādi, pūrṇimānta*.

(9) *Valābhi era* (current year = A.D. year *minus* 318). *Current, Kārttikādi, amānta*, or *pūrṇimānta*.

A.D.	400 =	Valābhi	82 current.	A.D.	900 =	Valābhi	582 current
,,	500 =	,,	182 ,,	,,	1000 =	,,	682 ,,
,,	600 =	,,	282 ,,	,,	1100 =	,,	782 ,,
,,	700 =	,,	382 ,,	,,	1200 =	,,	882 ,,
,,	800 =	,,	482 ,,	,,	1300 =	,,	982 ,,

Not now in use. Was in use in Kāṭhiavāḍ and neighbourhood in centuries above indicated.

(10) *Vilāyati year* (current year = A.D. year *minus* 592). *Kanyādi, solar, current*.

Now in use in Orissa. Months begin invariably *on* the day of sankrānti instead of the next or the third day after.

This era bears to the Bengali san pretty much the same relation that the Valābhi bore to the Gupta era.

(11) *Amli year* (current year = A.D. year *minus* 592). *Luni-solar, current*. Lunar year changes in *Bhādrapāda śukla 12th*, i.e., some days before, or some days after, Kanyā sankrānti. Otherwise the same as Vilāyati. Current in Orissa. Probably bears the same relation to Vilāyati that the luni-solar year in the Telugu country bears to the solar year of the Tamil country (i.e., only new year day is different in each case).

(12) *Fasli year* (luni-solar) in Bengal, and N.W. India (current year = A.D. year *minus* 592); *pūrṇimānta and lunar Aśvinādi* (i.e., it begins on pūrnimānta Āśvina, bahula pratipad); luni-solar year for Bengal, just as the Bengal san is the solar year for the same tract of country. Like all luni-solar years, the *fasli* takes the number of the next solar san. Thus, A.D. 1900 was, Bengal san 1307 current, but the luni-solar *fasli* beginning on *Āśvina krishṇa pratipad of* A.D. 1900 takes the number of the next Bengal san, i.e., 1308 current. Hence the formula for Bengal *fasli* is "current A.D. year *minus* 592."

(13) *Dakhan fasli* (current year = A.D. year *minus* 593) was up to A.D. 1556 when its number was 963, a Hijra year, but from that year forward it has been kept as a solar year (identical in number with Bengal san), beginning, in parts of Bombay, when the sun enters the nakshatra *Mṛigaśiras*,* i.e. (now) about 7th or 8th June. The months, their periods of beginning, and number of days are the same as in the Muhammadan calendar.

(14) The *Madras fasli* year is an *agricultural, solar, tropical* year, beginning on 1st July and having no divisions of its own into months and days. Its formula is

* By Eye-table 8 the sun enters nakshatra Mṛigaśiras when his longitude is 53° 20′. The number of days corresponding to this (by Table IV-C) = 56. When the solar year commences (as it did in A.D. 1911) on 13th April, the sun's entry into Mṛigaśiras nakshatra would be on 56 + 13 = 69 days from 1st April, i.e., on 8th June.

"Current fasli = A.D. year *minus* 590." The agricultural or revenue year from 1st July 1910 to 30th June 1911 might be expressed quite as well by the expression "Revenue year 1910–11" as by the expression "Fasli 1320." The former expression would convey better sense to most people, and the expression "Fasli year," the use of which a blind tradition has consecrated in Madras, serves no other purpose than to confuse any one who is not a village accountant or a Tahsildar. It is a chronological anomaly and will no doubt gradually drop out of use.

(15) The Mahratta *Sūr-san*, *shahūr-san* or *Arābi-san* (current year = A.D. year *minus* 599) was extensively used under the Mahratta supremacy, and is still occasionally met with. Begins, like the Dakhan fasli, when the sun enters the nakshatra Mrigaśiras.*

(16) *Harshakāla era* (current year = A.D. year *minus* 606). Was current in Muttra (*Mathura*) in Kanauj, Nepal. Harsha 94 current = A.D 700, and so on.

(17) *Nevar era* (used in Nepal from A.D. 878 to A.D. 1768), *expired, Kārttikādi, Amānta.*
Formula "Nevar expired = A.D. year *minus* 879."
Nevar 21, expired = A.D. 900.
Nevar 821, expired = A.D. 1700.

(18) *Chalukya era* (expired year = A.D. year *minus* 1076). This was in use only from A.D. 1079 to A.D. 1162. It followed the śaka months and pakshas. Chalukya 24 expired = A.D. 1100.

(19) *Lakshmana Śena era*: (expired year = A.D. year *minus* 1108, according to present day almanacs). Now in use in Tirhut and Mithila, but along with the śaka or Vikrama era.

Dr. Kielhorn concludes that the formula for this era was (from A.D. 1194 to A.D. 1551). "Expired Lakshmana Śena year = A.D. year *minus* 1119." According to this formula A.D. 1200 would be equivalent to Lak. Śena 81, expired. The years of this era were *expired, Kārttikādi, amānta.*

(20) *Mahratta Raja śaka era* (current year = A.D. year *minus* 1673) was established on the accession of Śivāji: the number of the year used to change every *Jyeshṭha śukla trayodasī*, which was the tithi or date of Sivāji's accession. Otherwise same as southern luni-solar amānta śaka years.

(21) *Tārikhi-i-Ilāhi* (= mighty or divine era), dating from the accession of Akbar (14th February 1556), fell into disuse *temp.* Shah Jehan. Days and months were solar, without intercalations.

SECTION XIX.—*Tithis in relation to festivals and* vice versa.

154. *Day on which a festival is celebrated.*—As a *tithi* generally covers a portion of two days, it sometimes happens that though for civil purposes the tithi of a day is that which is current at sunrise, yet, for religious purposes, the tithi may have to be celebrated on the previous day when it begins. When a tithi is appointed for the celebration of a feast or fast, to be kept at forenoon, midday, late afternoon, midnight, etc., it is obvious that the feast or fast must be observed on the day when the tithi covers the prescribed part of the day. The day for such purposes is divided, first of all, into five portions *between sunrise and sunset.*

(1) *Prātahkāla*, or early forenoon, 6 ghaṭikas from sunrise.
(2) *Sangava*, or forenoon, 6 to 12 ghaṭikas from sunrise.
(3) *Madhyāhna*, or midday, 12 to 18 ghaṭikas from sunrise.
(4) *Aparāhna*, or afternoon, 18 to 24 ghaṭikas from sunrise.
(5) *Sāyāhna*, or late afternoon, 24 to 30 ghaṭikas from sunrise.

(*a*) The 4 ghaṭikas before sunrise are called *aruṇodaya* or rise of dawn.
(*b*) The 6 ghaṭikas after sunset are called *pradosha* or evening.
(*c*) The 2 ghaṭikas in the middle of the night are called *niśītha*, midnight.
(*d*) A festival marked as *pūrvaviddha* is celebrated on the first day of the tithi, not on the second. A festival celebrated on the second day on which a tithi is current is said to be *pāraviddha.*

N.B.—Tithi dvayam.—Two tithis meeting, i.e., one commencing and the other ending, between 18 and 24 ghaṭikas after sunrise, when a similar meeting does not take place next day.

* By Eye-table 8 the sun enters nakshatra Mrigaśiras when his longitude is 53° 20′. The number of days corresponding to this (by Table IV-C) = 56. When the solar year commences (as it did in A.D. 1911) on 13th April, the sun's entry into Mrigaśiras nakshatra would be on 56 + 13 = 69 days from 1st April, i.e., on 8th June.

155. *Festivals connected with nakshatras as well as tithis.*—On the nakshatra Śravishṭhā (No. 23) in lunar Śravaṇa, the ceremony of Upākarma (Âvaṇi Aviṭṭam, is celebrated. Eye-table, section 8 shows that this festival would ordinarily fall about full moon in Śravaṇa. In the same manner, all festivals associated with particular *nakshatras* may be equally well connected with particular *tithis*. In Southern India, however, it is usual to connect *nakshatra* festivals with certain *solar* months in which they are celebrated; e.g., *Paṅguni Uttaram* (i.e., *Uttara Phalgunī* nakshatra in the solar month called *Paṅguni*), *Chittirai Mūlam* (i.e., *Mūla* nakshatra in the solar month called *Chittirai*); *Āvaṇi Aviṭṭam* (vide supra), etc. *Tithi* festivals are also often connected in Southern India with solar months; and if a festival falls, for instance, on śukla panchamī in a particular solar month, and there are two śukla panchamīs in that month, the first is called *sūnya tithi* and the second only is celebrated.

Occasionally something else is required for the celebration of a feast besides the concurrence of a *tithi* and a *nakshatra*; and there are also festivals and fasts which cannot conveniently be arranged under tithis. Such matters are arranged in the following alphabetical notes, which will be of interest to the general reader as well as to students of epigraphy.

156. *Amāvāsyā*: the Tarpaṇa or minor *Śrāddha* should be in *aparāhna*. If it occurs in *aparāhna* on two days, and is less than 60 ghaṭikas in length, it is kept on the first day; otherwise (i.e., if of normal length or longer) on second day. If not occurring in *aparāhna* of two days, it should be kept on the first day. The same rule is observed for śrāddhas.

Śuklayajurveda.—Amāvāsyā is kept on the third day, before moonrise.

Time for yāgās (yājnya kāla).—The last fourth part of a *parva* (i.e., either amāvāsyā or paurṇamī) and first three parts of pratipad are suitable as *yāgakāla*. If there is yāgakāla on two days, then the day on which the kāla is current at noon is the proper day.

Chaturdaśī (14th tithi).—Bahuḷa chaturdaśī in *every month* is *Śivarātri*, but Māgha ba. 14 is *Mahā Śivarātri*.

Chāturmāsya dvitīyās.—Bhādrapada ba. 2; Āshāḍha ba. 2; Phālguṇa ba. 2; Kārttika ba. 2.

The *bahuḷa dvitīyā* in Âshāḍha, Śrāvaṇa, Bhādrapada and Āśvina is called Asūnyasayana vrata and the fast is broken at moonrise.

Ekādaśī (11th tithi).—Every ekādaśī is sacred, like every amāvāsyā, and receives a special name. It is called *Vijayā* when joined with the nakshatra "Punarvasū." The following are the names of the 24 ekādaśīs: (12 in bright halves and 12 in dark halves of the 12 lunar months):—

Month.	Sukḷapaksha.	Bahuḷapaksha.
Chaitra	Kāmadā ekādaśi	Varūthini ekādaśi.
Vaiśākha	Mohini do.	Aparā do.
Jyēshṭha	Nirjalā do.	Yogini do.
Āshādha	Vishnuśayan otsava; Śayani or Vishnuśayani ekādaśi (i.e., Vishnu going to sleep).	Kāmadā do. or Kāmikā do.
Śrāvaṇa	Putradā ekāduśi	Ajā do.
Bhādrapada	Vishnuparivartanotsava *or* Parivartini ekādaśi (Vishnu turning on his side, called Vishnuśṛinkhala, when 11th and 12th tithis meet in nakshatra 'Śravaṇa.')	Indirā do.
Āśvina	Pāśānkusa ekādaśi	Rama do.
Kārttika	Prabodhini ekāduśi (waking of Vishnu), Bhishma panchakavrata commences.	Utpatti do.
Mārgaśirsha	Mokshadā ekādaśi	Saphalā do.
Pausha	Putradā ekādaśi or Mukkoṭṭi or Vaikunṭha ekādaśi.	Shaṭṭilā do.
Māgha	Jayā ekādaśi	Vijayā do.
Phālguṇa	Āmalaki ekādaśi	Pāpamochini ekādaśi.

(Vaishṇavas).—If *daśamī* ends after 56 ghaṭikas, the fast is on *dvādaśī* day.

If on ekādaśī day, there is any part of *navamī* or *daśamī* day, then also the fast should be kept on *dvādaśī*.

If *dvādaśī* touches three days, then the fast is on the day which is wholly *dvādaśī* and pāraṇam on the next day when dvādaśī ends.

In any other case, *ekādaśī* is the fast day and dvādaśī the day of pāraṇam.

Sanyāsins and widows of all creeds observe this rule for *ekādaśī*.

(Smārthas)—Even if *daśamī* ends after 56 ghaṭikas, the fast is kept on *ekādaśī*.

If dvādaśi touches three days, Smārthas observe the first *dvādaśī* day as *ekādaśī*.

(Kāmyá ekādaśī).—Those who observe ekādaśī for *kāmya* purposes (begetting children, etc.) observe the Smārtha rule: those who observe ekādaśī for *mōksha* (like Sanyāsins) observe the Vaishṇava rule.

If a death occurs on the day of ekādaśī fast, whether it be ekādaśī or dvādaśī tithi, then the śrāddha is on the next day. Only Mādhvas and Tengalai Vaishṇavas observe this rule: Smārthas and Vadagalai Vaishṇavas observe the śrāddha on ekādaśī fast day also.

Grahaṇa.—For 9 hours before commencement of a lunar eclipse, and for 12 hours before commencement of a solar eclipse, neither śrāddha nor meals are allowed: they are allowed after *mōksha*, i.e., release of the eclipsed body. On the occasion of a *grasthōdaya*, eclipse of the moon (when moon rises in an eclipsed condition), neither śrāddha nor meals are allowed during day, and after *mōksha*, performers of purṇimā śrāddha must fast and perform śrāddha next day, but others may have food at night.

Grasthāsthamanam (lunar eclipse).—If the moon sets in an eclipsed condition, meals are allowed only after next moonrise, except to the performer of śrāddha, who must fast in the night and perform śrāddha next day.

According to Manu, no srāddha on account of a tithi can be performed at night, but śrāddhas on account of eclipse must be performed during the time of eclipse, even if it be at night.

Jayanti—

1. *Matsya jayanti*—Chaitra su. 5 (*aparāhna*).
2. *Kūrma jayanti*—Jyeshṭha su. 12 (*pradōsha*).
3. *Varāha jayanti*—Chaitra su. 9 (*aparāhna*).
4. *Nārisimha jayanti*—Vaiśākha su. 13 (*pradōsha*).
5. *Vāmaṇa jayanti*—Bhādrapada su. 12 (*madhyāhna*).
6. *Parasurāma jayanti*—Vaiśākha su. 3 (between 6 and 9 p.m.).
7. *Srī Rāma jayanti*—Chaitra su. 9 (*madyāhna*).
8. *Balarāma jayanti*—Bhādrapada su. 3 (*madyāhna*).
9. *Krishna jayanti*—Śrāvaṇa b. 8 (must be current at midnight).
10. *Bauddha jayanti, Kalki jayanti*—Jyeshṭha su. 3 (*pradōsha*).

Kalpādi—

Kūrma kalpādi—Chaitra su. 5 *or* Chaitra Amāvāsyā.
Pārthiva kalpādi—Vaiśākha ba. 3.
Sāvitri kalpādi—Kārttika su. 7.
Praḷaya kalpādi—Mārgaśīrsha su. 9.
Varāha kalpādi—Māgha su. 13.
Brahma kalpādi—Phālguna ba. 3.
} (*pūrvāhna.*)

Mādhva tīrthams and Puṇyadinams.—South of Madras, Mādhvas observe these commemorations as *aparāhna vyāpini* and North of Madras, they observe them as *udaya vyāpini*, because the days are days, not of birth, but of death.

These festivals are associated with lunar months and tithis, and are inserted in the general list accordingly.

Manvādi—

List of *Manvādis*—

1. Svārochisha—Āśvina su. 9.
2. Svāyambhuva—Kārttika su. 12.

3. Uttama—Chaitra su. 3.
4. Tāmasa—Bhādrapada su. 3.
5. Agnisāvarṇi—Śrāvaṇa Amāvāsyā.
6. Raivata—Pushya su. 11.
7. Chākshusha—Āshāḍha su. 10.
8. Vaivasvata—Māgha su. 7.
9. Sūryasāvarṇi—Bhādrapada su. 7.
10. Rudrasāvarṇi—Āshāḍha ba. 8.
11. Indrasāvarṇi—Kārttika ba. 8.
12. Brahmasāvarṇi—Phālguṇa *pūrṇimā.*
13. Rauchyaka—Chaitra pūrṇimā.
14. Bhauchya—Jyeshṭha pūrṇimā.

N.B.—Manvādi and *Yugādi*, occurring in *śuklapaksha*, should be in *pūrvāhna*, i.e., before noon: if they occur in *krishṇapaksha*, they should lie within *aparāhna*, i.e., afternoon.

Māsa Śivarātri.—Every month, ba. 14 (*pradosha* or *pūrvaviddha*) is *Śivarātri.* See *Chaturdaśī.**

Panchadaśī (15th tithi).—A śukla 15 or pūrṇimā (full moon) is called *Somavatī* when it falls on Monday and is special for donations.

It is called *chūḍāmaṇi* when it is *further* joined with an lunar eclipse.

Most pūrṇimās receive special names, which are given in the general list.

Paraviddha, a tithi kept on the day on which it ends.

Pratipad (1st tithi).—The Chaitra śukla *pratipad*, i.e., that which precedes the Mēsha sankrānti, is the beginning of the Hindu lunar year, new year's day (lunar) being that on which the pratipad is current at sunrise. (When there is an *adhika Chaitra*, that begins the year.) The tithi is therefore called *Vatsarārambha* (commencement of the year). It is also *Navarātrārambha*, there being another *Navarātrārambha* on *Āśvina* śukla pratipad.

Pūrvaviddha.—A tithi kept on the day on which it begins, provided it begins more than 4 ghaṭikas before the sunset of one day and ends before sunset of following day.

Pushkara, or festival of a river, is celebrated when Jupiter enters certain signs of the zodiac. The signs for the 12 chief rivers are—

Jupiter in	Mēsha—Gangā.	Jupiter in	Tulā—Kāvērī.
,,	Ṛishabha—Revā.	,,	Vṛiśchika—Bhīmarathī.
,,	Mithuna—Sarasvatī.	,,	Dhanus—Pushkaram.
,,	Karkaṭaka—Jamna.	,,	Makara—Tungabhadrā.
,,	Siṁha—Gōdāvarī.	,,	Kumbha—Indus.
,,	Kanyā—Kṛishṇā.	,,	Mīna—Sapranītantasī.

The moment of Jupiter's entry into a rāśi is the Pushkaram, and the period of the festival is 12 days.

A rāśi into which Jupiter enters twice (i.e., before retrogression and after) is counted only at second entry.

N.B.—For time of entry of Jupiter into the several rāśīs, during the years 1024 B.C. to A.D. 1999 see Tables V-A and V-B.

Sankramaṇa.—When sankrānti occurs during daylight, it should be observed as closely as possible: if after sunset, it is kept on the first day in the case of sankrānti occurring before midnight: otherwise, next day. If at midnight, it may be kept on either day. Ṛishabha, Siṁha, Vṛiśchika, Kumbha sankrāntis (sthira rāśi sankrāntis) are called *Vishṇupāda*. Mithuna, Kanyā, Dhanus, Mīna (dvisvabhāva rāśīs) are called *Shaḍasīti puṇyakāla.*

Mēsha and Tulā sankrāntis are called Vishuvat punyakāla. Karkaṭaka and Makara sankrāntis are called respectively Dakshināyana and Uttarāyaṇa punyakāla.

Sopapadas.—Jyeshṭha su. 2, Āśvina su. 10, Māgha su. 4 and 12 (*pūrvāhna*).

Tisroshṭakas.—7th, 8th and 9th tithis in bahuḷa paksha of Mārgaśīrsha, Pushya, Māgha, Phālguṇa (*aparāhna*).

Upākarma.—Srāvaṇa su. 15 (*samgavavyāpinī* 6 ghaṭ. to 12). For Yajurvedīs, if Sankramaṇa, Mūḍham, heliacal setting of Jupiter or Venus or eclipse concur, then the upākarma is on Bhādrapada pūrṇimā; if that also is objectionable, then

the people observe it in Āshāḍha; but this is not according to the śāstras, which require it in this case to be performed in Śrāvaṇa month.

"Śravaṇa" nakshatra is the date for Ṛigvedīs, whether the tithi be su. 14 or 15 or ba. 1.

For Vājasaneyīs, pūrṇimā must be *madhyāhna vyāpini*.

In Siṁha month, "Hasta" day is upākarma for Sāmavedīs south of the Narbaḍha. For those north of the Narbaḍha, "Hasta" nakshatra in Śrāvaṇa month is the appointed time.

Vatsarārambha—lit: beginning of the year, is the name given to Chaitra su. 1, which marks the commencement of the Hindu lunar year, and which is the su. 1 immediately preceding the Mēsha sankrānti. When there is an *adhika* Chaitra, su. 1 of that month begins the year. Pratipad is *pāraviddha*, i.e., it is kept on the day on which it ends. When pratipad is *kshaya*, it is kept on Amāvāsyā day: when it touches three days, it is kept on the third day.

Yogas—

Budhāshtamī.—Su. 8 + Wednesday in any month.

Ekādaśī Guruvāra vrata.—Ekādaśī + Thursday in any month and either paksha.

Śani trayōdaśi.—~~Shashṭhi~~ +trayōdaśī in any month and either paksha.

Kṛishṇāṅgāraka chaturdaśī vrata.—Kṛishṇa paksha 14+Tuesday in any month (divavyāpini, i.e., must be between sunrise and sunset).

Strīnām chandradarśanam.—The whole of the night from sunset to sunrise must be pūrṇimā without occurrence of chaturdaśī.

Amāvāsyā Sōmavāra vrata.—Monday +Amāvāśya.
Bhānu saptamī.—Sunday+saptami, any month and either paksha.
Aṅgāraka Chaturthī.—Tuesday+chaturthī.
Ashṭami. Sōmavāra vrata.—Monday+ashṭamī.
} Tithi must be current at sunrise and noon (*divavyāpini*).

Mahapaurṇamī vrata.—Moon and Jupiter should join in the nakshatra whence the month takes its name.

Mahāmāgha.—*Saturn* in Mēsha +*moon* in "Māgha"+*Jupiter* in Siṁha+ *sun* in "Śravaṇa" nakshatra.

Mahāvyatīpāta.—*Jupiter* and *Mars* in Siṁha+*Venus* in Mēsha + su. 12 + "Hasta" nakshatra *in any month*.

Govindadvādaśī.—*Sun* in Kumbha+*Jupiter* in Dhanus+Śukha (i.e., *auspicious*) tithi, vāra, and nakshatra in Phālguṇa śukla paksha: *otherwise sun* in Kumbha + *Saturn* in Makara + su. 12 + "Pushya" nakshatra.

Kūhayōga—Tyājya at meeting of Amāvāsyā and pratipad.

Yugādi—

Kritāyugādi—Kārttika su. 9.
Tretāyugādi—Vaiśākha su. 3.
Dvāparayugādi—Māgha Amāvāsyā.
Kaliyugādi—Bhādrapada ba. 13.

Manvādi and Yugādi occurring in *śukla paksha* should be in *pūrvāhṇa*, i.e., beforenoon: if they occur in *krishṇa paksha*, they should be within *aparāhna*, i.e., afternoon.

Yugānta—

Kṛtayugānta—Siṁha sankrānti.
Tretāyugānta—Vṛiśchika ,,
Dvāparayugānta—Vṛishabha ,,
Kaliyugānta—Kumbha ,,
} Same rule as for sankrānti. *q.v.* as regards time of day.

157. *Table of Hindu fasts, feasts and festivals*—

Note.—The sign + means "combined with." The abbreviation "when +" means "when the tithi in question is combined with." *Asterisks* refer to the alphabetical list prefixed to this table.

Chaitra.

Su. 1. Chāndra Vatsarārambha. Navarātrārāmbha Nimbakusuma pakshana.
„ „ Vēdavyāsa Tīrtham (Mādhvas).

Su. 3. Āndōlana-tritīyā *(paraviddha)*. Gaurī-tritīyā Matsajayanti (afternoon). Manvādi.
Su. 5. Lakshmī panchamī or Srīpanchamī *(pūrvaviddha)*. Kalpādi * *(pūrvāhna)*.
Su. 8. Bhavāni-utpatti *(paraviddha)*; bathing special when + Wednesday + Nak. "Punarvasū." Aśokāshtami.
Su. 9. Rāma navami or *Śrīrāma jayanti (madhyāhna)*. Varāha jayanti aparāhna Kavindira-tīrtham (Mādhvas).
Su. 10. Dharmarāja daśamī.
Su. 11. Ḍōlotsava. Kāmadā ekādaśī. See *Ekādaśī*.
Su. 12. Vāmana dvādaśi. Jayā; when + nakshatra "Pushya." See *Dvādaśi*.*
Su. 13. Madana trayōdaśi *(pūrvaviddha)* or Ananga pūjana vrata; god of love worshipped. Satyavrata tīrthānām puṇyadinam (Mādhvas).
Su. 15. Damanakōtsava *(pūrvaviddha)*; (special for bathing when + Sunday, Thursday or Saturday. Manvādi * (forenoon). Hanumatjayanti. Vīrarāghava tīrthānām puṇyadinam (Mādhvas).
Ba. 3. Vāgīśa ṭīrthānām puṇyadinam (Mādhvas).
Ba. 11. Varūthini ekādaśi. Satyavijaya tīrthānām puṇyadinam (Mādhavas).
Ba. 13. Vāruṇī; when + Nak. "Śatabhishaj." Māhāvāruṇī; when + Nak. "Śatabhishaj" + Saturday. Mahāmahāvaruṇī; when + Nak. "Śatabhishaj" + Saturday + Yoga Śubha. Satyapriya tīrthānām puṇyadinam (Mādhvas).
Ba. 15. Kalpādi.*

Vaiśākha.

Su. 3. Akshayatritīyā *(pūrvaviddha)*; special when + Wednesday + Nak. "Rohiṇī." Trētāyugādi. See *Yugādi*.* Parasurāma jayanti.
Su. 4. Vidyādhirāja tīrtham (Mādhvas).
Su. 5. Sankara's birthday.
Su. 6. Rāmachandra tīrtham (Mādhvas).
Su. 7. Gangā saptamī or Gangōtpatti; birth of Gangā; midday.
Su. 11. Paraśurāma ekādaśī. Mōhini Ekādaśi.
Su. 12. Vyatīpāta (when Nak. "Hasta" + *Jupiter* and *Mars* in Simha + *Sun* in Mēsha).
Su. 13. Narasimha jayanti *(pradōsha)*.
Su. 14. Narasimha jayanti.
Su. 15. Vaiśākhi pūrṇimā. Sampat Gaurī vrata *(paraviddha)*. Kūrma jayanti *(pradōsha)*. See *Jayanti* * Maha-Vaiśākhi; when purṇimā + *sun* in Mēsha + *Jupiter* in Dhanus + *Mars* in Makara + *Saturn* in Tulā + *Nak.* "Viśākhā" + Varīya *yoga* + Sunday.
Ba. 3. Kalpādi * *(pūrvāhna)*.
Ba. 11. Aparā ekādaśi.

Jyeshṭha.

Su. 2. Sopapada. Satyasandha tīrtham (Mādhvas).
Su. 3. Rambhā-tritīyā *(pūrvaviddha)*; worship of Bhavāni. Buddha jayanti. Kalki jayanti *(pradōsha)*.
Su. 6. Araṇya Gaurī vratam *(pāraviddha)*.
Su. 10. Daśaharā (expiation of ten sins), *or* Gangāvatāra. Jyēshṭha Su. 10 + Wednesday (*or* Tuesday) + Nak. "Hasta" + *Yoga* "Vyatīpātā" is called DAŚAHARI.
Su. 11. Nirjalā ekādaśī.
Su. 12. Rāmalakshmaṇa dvādaśi. Kūrma jayanti * *(pradōsha)*.
Su. 15. Ṛishabha pūja. Mahājyeshṭhā (*Jupiter* in Aindra, i.e., *Nak.* "Jyeshṭhā" + *moon* in Aindra or Nak. "Jyeshṭhā" + *sun* in Nak. "Rohiṇī" + Jyeshṭhā pūrṇimā. Manvādi * and Vaṭa Pūrṇimā or Vaṭa Sāvitri *(pūrvaviddha)*.
Ba. 2. Satya pūrṇa tīrtham (Mādhvas).
Ba. 3. Raghu varīya tīrtham (Mādhvas).
Ba. 8. Trilōchana pūja.

BA. 11. Yoginī ekādaśi.
BA. 14. Satyābhinava tīrtham (Mādhvas).
BA. 15. Vaṭa Sāvitri vratam (*pūrvaviddha*).

Āshāḍha.

SU. 2. Ratha-yātra dvitīyā *or* Rāmarathōtsava.
SU. 3. Satyādhirāja tīrtham (Mādhvas).
SU. 5. Skanda-panchamī (*pāraviddha*).
SU. 6. Kumāra shashṭhī (*pāraviddha*).
SU. 7. Vivasvat saptamī; (when + Nak. "Pūrva-Phalguṇī").
SU. 10. Lakshmīvratārambha. Śāka vratārambha. Manvādi* (forenoon).
SU. 11. Śayana ekādaśi (not to be observed in adhika month); *or* Vishṇuśayana ekādaśi *or* Vishṇuśayanōtsava; (i.e., Vishṇu going to sleep).
SU. 12. Gōpadma vratārambha. Chāturmāsya* vrata commences.
SU. 14. Pavitrārōpaṇam (*pāraviddha*). See *Upakarma.**
SU. 15. Vyāsapūrṇimā (6 to 9 ghāt. after sunrise). Hariśāyanam. (*Sāyāhnavyāpinī*). Manvādi* Śivaśayanotsava *or* Kokila vrata *or* Vyāsapūja.
BA. 2. Chāturmāsya dvitīya.* Asūnyaśayana vrata; fast broken at moonrise.
BA. 3. Śrīvijaya tīrtham (Mādhvas).
BA. 7. Special, when + Nak. "Revatī" + Tuesday.
BA. 8. Manvādi.*
BA. 11. Kāmadā or Kāmika ekādaśi. v. *Ekādaśī.**
BA. 12. Pāpanāśini, when + Nak. "Rohiṇī." See *Dvādaśī.**
BA. 15. Satyādīśa tīrtham (Mādhvas).

Śrāvana.

SU. 3. Madhu-Sravā (in Guzerat).
SU. 5. Nāgapanchamī (*pāraviddha*); worship of snakes.
SU. 6. Suryashashṭhī (*pāraviddha*). Hala-shasṭhī.
SU. 7. Satyavara tirthānām puṇyadinam (Mādhvas).
SU. 10. Dadhivratārambha.
SU. 11. Putradā ekādaśī.
SU. 12. Dāmōdara dvādaśī, Vishṇoh-pavitrāropanam.
SU. 14. Varalakshmī vrata, on Friday, nearest to purṇimā in śuklapaksha.
SU. 15. Hayagrivōtpatti; Upākarma.* Rig-yajuh-Śrāvaṇī. Rakshābandhana (tying a string round the arm), or Rakipūrṇimā; or Nāralipūrṇimā (when coconuts are thrown into the sea).
Hayagriva jayanti; or Hayagrivotpattī.
BA. 2. Aśūnyaśayana vrata. See "Chāturmāsya dvitīyā."* Rāghavendraswāmi puṇyadinam (Mādhvas).
BA. 3. Kajjalī-tritīyā
BA. 4. Bahuḷa chaturthī; when cows are worshipped.
BA. 7. Śītalā saptamī or Śītalā-vrata (*pūrvaviddha*).
BA. 8. Janmāshṭamī. Krishnāshṭamī or *Krishna-Jayanti.* Special when + Nak. "Rohiṇī"; less so when joined only to Monday or Wednesday Manvādi.* Vaishṇavas observe this invariably in Simha month.
BA. 11. Ajā ekādaśī.
BA. 12. Jayantī; (when + Nak. "Punarvasū"). See Dvādasī.*
BA. 13. Satyadharma tirthānām puṇyadinam (Mādhvas).
BA. 15. Pithori or Kuśotpatinī (end of Śrāvaṇa). Manvādi.*

Bhādrapada.

SU. 1. Maunavratam (*pūrvaviddha*).
SU. 3. Shōḍaśomāvratam. Varāha jayanti (see *Joyanti**). Haritālika; worship of Pārvatī. Manvādi.* Śivā (a name for this tithi). Bālarāma jayanti (*madhyāhna*).

Su. 4. *Vināyaka chaturthī* (*madhyāhnavyāpinī*) Spl. when + Sunday or + Tuesday.
Su. 5. Ṛishipanchami (*aparāhnavyāpinī*).
Su. 6. Champa shashṭhī (when + Nak. "Viśākhā" + Yoga Vāidhriti + Tuesday). Sūrya shashṭhī (*pāraviddha*) *or* Skanda shashṭhī.
Su. 7. Amuktābharaṇa saptamī (*pūrvaviddha*). Jayasaptamī Aparājitā, Manvādi.*
Su. 8. Durvāshṭamī (*pūrvaviddha*). Jyeshṭhā pūja (when + Nak. "Jyeshṭhā"). Jyeshṭhā-Gaurī-pūjna-vrata, when + nakshatra "Jyeshthā."
Su. 9. Nandanavamī. Aḍhukha-navamī.
Su. 10. Kshīravratārambha. Satyāshthakāma tīrthānām puṇyadinam (Mādhvas).
Su. 11. Vishṇu parivartanōtsava *or* Parivarttana ekādaśī. Lakshmīnārāyaṇa Yoga.
Su. 12. Kalki-dvādaśī. Sakrottāpanam. Vāmaṇa-jayanti (*madhyāhna*) (see *Jayanti* *). Srāvaṇa-dvādaśī (when + Nak. Śravaṇa, + Wednesday). Vijaya, (when + Nak. "Śravaṇa"). See *Dvādaśī.**
Su. 14. Anantavratam *or* Anantapadmanābha Chaturdaśī (*pūrvaviddha*); must be current for 3 muhūrthas, *i.e.*, 6 ghaṭikas, after sunrise; and for those who perform this *vrata* for the first time, the tithi must be current at noon.
Su. 15. Praushṭhapadī pūrṇimā *or* Śrāddha.
Ba. 1. Mahālayapakshārambha. (Mahālaya when + Nak. "Bharaṇī" in *aparāhna*).
Ba. 2. Aśūnyaśayana-vrata. "Chāturmāsya dvitīya." *
Ba. 3. Brihatyuma vratam (*pāraviddha*).
Ba. 6. Chandrashasṭhivratam. Kapila shasṭhī (when + Nak. "Rōhiṇī" + Yōga "Vyatipāta" + *Sun* in "Hasta" + Tuesday.
Ba. 8. Rudrāshṭamī (*pradōshakāla vyāpinī*). Madhyāshṭamī. Mahālakshmī vrata (*pūrvaviddha*). Ashṭaka Śrāddha.
Ba. 9. Durgā navamī (in Maharāshtra). Gajagaurī vratam (when + *Sun* entering nakshatra "Hasta").
Ba. 10. Hariśankara Yōga (*pūrvaviddha*), when there is a concurrence (1) of ba. 9 and ba. 10. (2) of Nak. "Punarvasū" and Nak. "Pushya," (3) of "Śivayōga" with "Siddhayōga," and (4) of "Garijakaraṇa" with "Vanijakaraṇa"; for 8 ghaṭikas by day or night; may be kept in *adhika* months.
Ba. 11. Indirā ekādaśī.
Ba. 12. Yatimahālaya (*aparāhna vyāpinī*). Jayā (see Dvādaśī *).
Ba. 13. Gajachchāyā (when + *Sun* in "Hasta" + Nak. "Maghā"). Kaliyugādi. See *Yugādi.** Maghā trayōdaśī (Nak. "Maghā").
Ba. 14. Vishaśastrahatānām Mahālaya.
Ba. 15. Sarvapitṛi *or Mahālaya Amāvāsyā.* Special, when *sun* and *moon* are both in Nak. "Hasta." Mādhava tīrthānām puṇyadinam (Mādhvas).

Āśvina.

Su. 1. Chaṇḍīpūjārambha or commencement of *Navarātri* (*pāraviddha*). Stanavriddhi Gaurī vratam.
Su. 5. Upāngalalita Gaurī vratam: esp. in Mahārashtra (*pūrvaviddha*). Sarasvatīpūjārambha ("Mūla" Nak.), Lalitā panchamī.
Su. 7. About this tithi, when it concurs with Nak. "Mūla," Sarasvatī is worshipped. Satyaprayana tīrthānām puṇyadinam (Mādhvas).
Su. 8. Mahāshṭamī (Spl. when + Tuesday). Satyaparākrama tirthānām puṇyadinam (Mādhvas).
Su. 9. Mahānavamī (*pūrvaviddha*) or Durgā-navami Manvādi.* Āyuda pūja.
Su. 10. Vijayadaśami *or Daśara* (*pūrvaviddha*); (Spl. when + Nak. "Śravaṇa"). Rājnyā paṭṭābhishekha (*pāraviddha*).
Sarasvatīpūja (ends in "Śravaṇa" Nak.) Dvidaḷa vratārambha: Buddha-Jayanti. (See *Jayanti.**) Sopapada

Su. 11. Pāśānkuśa ekādaśī.
Su. 12. Padmanābha dvādaśī, Godvādaśi (*pradōsha vyāpinī*). Vijayā (when + Nak. "Śrevaṇa"). See *Dvādaśī.*
Su. 15. Dhanaphalavratārambha, when + Sunday. Kaumudyutsava (*pūrvaviddha*). Kojāgari pūrṇimā or Kojāgari vrata ; worship of Lakshmī and Indra. Games of chance. Navānna pūrṇimā (when new grain is cooked).
Ba. 2. Aśunyaśayana-vrata. See "Chāturmāsya dvitīya."
Ba. 3. Chandrōdaya Māsa vratam (*pāraviddha*).
Ba. 11. Ramā ekādaśī.
Ba. 12. Gōvatsa dvādaśī.
Ba. 13. Dhanatrayodaśī ; when money lenders worship money.
Ba. 14. Narakachaturdaśī (*pūrvaviddha*) or Dīpāvalipaṇam, Dīpadānam. Svātyabhyanga (at moonrise).
N.B.—Dīpāvali is special on this tithi if joined to Nak. "Svāti."
Ba. 15. Kedāra vratam (*pāraviddha*).

Kārttika.

Su. 1. Balipratipad *or* Balipūja.
Su. 2. Yamadvitīyā (*aparāhṇavyāpinī*) *or* Bhrātṛidvitīyā.
Su. 3. Ālochana Gaurī vratam (*pāraviddha*).
Su. 4. Nāga chaturthī (*pāraviddha ; madhyāhna vyāpinī*).
Su. 6. Mahāshaṣṭhī ; special for feeding of Brahmans when it falls on Tuesday.
Su. 7. Kalpādi * (*pūrvahna*).
Su. 8 Gō-ashṭāmi (*pāraviddha*).
Su. 9. Kretāyugādi. See *Yugādi.*
Su. 10. Satyavara tīrthānām puṇyadinam (Mādhvas).
Su. 11. Bōdhana ekādaśī *or* Prabodhini ekādaśī. Bhīshmapanchaka vrata. Vedanidhi tīrthānām puṇyadinam. (Mādhvas.)
Su. 12. Yōgeśvaradvādaśī. Kshirābdhi mahōtsava. Chāturmāsya vrata * (begins). Prabōdhotsava *or* Utthāna dvādaśī (preparation for waking Vishnu). Tulasi vivāha. Manvādi.*
Su. 14. Vaikuṇṭha chaturdaśī—midnight (*rātrivyāpini*). Tulasī vratodhyāpanam.
Su. 15. Special (when + Nak. "Krittikā"). Jvālātoraṇam (*pradōsha vyāpinī*). Dhatṛi yōga (when + Nak. "Krittikā"). Manvādi *Chāturmāsya vrata (ends). Tripuri pūrṇimā *or* tripurōtsava. Mahākārttikī (when + Nak. "Rohiṇī"), or when *moon* and *Jupiter* are both in Nak. "Kṛittikā" on Kārttika su. 15. Pādmakayoga (when + *Sun* in Nak. "Viśākha" + *Moon* in Nak. "Kṛittikā"). *Kṛittika* Festival.
Ba. 2. Kārttika "Chāturmāsya dvitīyā."*
Ba. 3. Vidyānidhi tīrthānām puṇyadinam (Mādhvas).
Ba. 8. Krishnāshṭamī v. *Ashṭamī.** Kāla-Bhairāvāshṭanī *or* Kāla-Bhairava jayanti. Manvādi.*
Ba. 11. Utpatti ekādaśī.
Ba. 13 Yamadīpa (*pradōsha vyāpinī*).
Ba. 14. Padmanābha tīrthānām puṇyadinam (Mādhvas .

Mārgaśirsha.

Su. 5. Nāgapūjā or Nāgapañchamī.
Su. 6. Skanda shashṭhī (*pūrvaviddha*), *or* Mahā shashṭhī. Champa shashṭhī ; Śiva worshipped as Khandoba. Spl when + Sunday or Tuesday + Nak. "Śatabhishaj" *or* + Yoga "Vaidhriti."
Su. 7. Mitra saptamī (*pūrvaviddha*). Sūryavrata.
Su. 9. Kalpādi (*pūrvāhna*).
Su. 10. Satyanidhi tīrthānām puṇyadinam (Mādhvas).
Su. 11. Mōkshadā ekādasī. Sātyanātha tirthānām puṇyadinam (Mādhvas).
Su. 12. Matsya-dvādaśī. Akhaṇḍa dvādaśī vratam.

Su. 13. Hanumad vratam (*Abhijitvyāpinī*).
Su. 14. Pāshāṇapakshana (*pradōshavyāpinī*), *or* Pāshāṇa chaturdaśī. Dattātreya jayanti (in some places; elsewhere it is su. 15).
Su. 15. Spl. for donations of salt, when + Nak. "Mṛigaśīrsha." Chandra Pūjā (*pradōsha*). *Śiva Pūjā* ("Ārdrā" Nak.). Dattātreya *or* Dattajayanti. Ārdrā festival.*
Ba. 1. Raghunātha tīrthānām puṇyadinam (Mādhvas).
Ba. 5. Akshobhya tirthānām puṇyadinam (Mādhvas).
Ba. 7. Tisroshṭaka * (*aparāhna*).
Ba. 8. Kālabhairava Ashṭamī (*rātrivyāpinī*). Ashṭaka-Srāddha. Tisroshṭaka* (*aparāhna*).
Ba. 9. Tisroshṭaka (*aparāhna*).
Ba. 11. Saphala ekādaśī.

Pausha.

Su. 8. Spl. when + Wednesday + Nak. "Bharaṇī"; † "Rohiṇī" *or* "Ārdrā," according to some.
Su. 11. Putradā ekādaśī *or Mukkoṭi Ekādasī or Vaikuṇṭha Ekādaśī*. Manvādi.* Raghūttama tīrthānām puṇyadinam (Mādhvas).
Su. 12. Kūrma dvādaśī.
Ba. 6. Satyakāma tīrthānām puṇyadinam (Mādhvas).
Ba. 7. Tisroshṭaka * (*aparāhna*). Naraharitīrthānām puṇyadinam (Mādhvas).
Ba. 8. Tisroshṭaka * (*aparāhna*). Ashṭaka Śrāddha.
Ba. 9. Tisroshṭaka * (*aparāhna*).
Ba. 11. Shaṭṭilā ekādaśī.
Ba. 14. Vidyādīśa tīrtham.
Ba. 15. Ardhodaya; when+Sunday+Nak. "Śravana"+yoga "Vyatīpāta." The tithi is called *Mahōdaya*, when any one of the above special features is wanting and the others are present. Purandharadāsa tīrtham (Mādhvas).

Māgha.

Su. 4. Tila chaturthī *or* Kuṇḍa chaturthī (*pūrvaviddha*) Sopapada.
Su. 5. Madana panchamī (*pūrvaviddha*). Vasanta panchamī; worship of Ratī and Kāma in forenoon; *or* Śripanchamī.
Su. 7. Rathasaptamī (*pāraviddha*) *or* Mahāsaptamī Chandrāvarkavratam. Manvādi.*
Su. 8. Bhīshmadarpanam (*pūrvaviddha*). Bhīshmāshṭamī.
Su. 9. Madhva navamī *or* Ananta tīrthānām puṇyadinam (Mādhvas).
Su. 11. Bhīshmapanchakam. Jayā Ekādaśī.
Su. 12. Bhīshmadvādāśī *or* Varāhadvādaśī. Sopapada.*
Su. 13. Kalpādi * (*purvāhna*).
Su. 15. Mahā Māghi; when *moon* and *Jupiter* are both in Nak. "Maghā."
Ba. 7. Tisroshṭaka.*
Ba. 8. Tisroshṭaka.* Ashṭaka Srāddha.
Ba. 9. Rāmadāsa navamī. Tisroshṭaka.*
Ba. 11. Vijayā ekādaśī.
Ba. 12. Tilā dvādaśī *or* Vijaya when + Nak. "Śravaṇa."
Ba. 14. *Mahaśivaratri*—midnight nearest ba. 14, when Nak. "Śravaṇa" is current; spl. when + yoga "Śiva" + Sunday or Tuesday. If Nak. "Śravaṇa" is current at two successive midnights, the second is *Śivarātri*.
Ba. 15. Dvāparayugādi. See *Yugādi*.*

Phālguṇa.

Su. 3. Vadiraja Svāmigaḷ puṇyadinam (Mādhvas).
Su. 4. Śānta chaturthī (*pāraviddha*).

Su. 6. Satyavratatīrthānām puṇyadinam (Mādhvas).
Su. 11. Āmalakī ekādaśī.
Su. 12. Narasimhadvādaśī.
Su. 13. Kāmadahanam (*pūraviddha*) at midnight.
The concurrence of Sunday, Saturday, Tuesday or Friday is an objection to the feast: *chaturdasī* (su. 14) is then the proper day. If that also is objectionable then this festival is celebrated at that midnight at which Nak. "Pūrva Phālguni" is current.
Su. 15. Helikotsava (*sāyāhana vyāpinī*). Manvādi.*
Holikā or Hutāśani pūrṇimā. In South India, Kāman Pandigai, commemorating the destruction of Cupid or Kāmadēva by Śiva.
Ba. 1. Vasantotsava. Satyabodha tīrthānam puṇyadinam (Mādhvas).
Ba. 2. Chāturmāsya dvitīyā.*
Ba. 3. Kalpādi * (*purvāhna*).
Ba. 4. Vyāsarāyaswāmigaḷ puṇyadinam (Mādhvas).
Ba. 5. Rangapanchamī; when colours are thrown about.
Ba. 7. Tisroshṭaka.*
Ba. 8. Tisroshṭaka.* Ashṭakaśrāddha.
Ba. 9. Tisroshṭaka.*
Ba. 11. Pāpamōchini ekādaśī.
Ba. 13. Vāruṇī, when + Nak. "Śatabhishaj."
Mahā-Vāruṇī, when + Nak. "Śatabhishaj" Saturday.
Mahā-Mahā-Vāruṇī, when + Nak. "Śatabhishaj" + "*Yoga* Śubha."
Ba. 15. Manvādi.*

158. In the following list the feasts, fasts and festivals are arranged in order of tithis:—

Pratipad (*Tithi I*).

The Chaitra śukla *pratipad*, i.e., that which precedes the Mēsha Sankrānti, is the beginning of the Hindu lunar year, New Year's Day (Lunar) being that on which the pratipad is current at sunrise. (When there is an *Adhika Chaitra*, that begins the year.) The tithi is therefore called *Vatsarārambha* (commencement of the year). It is also *Navarātrarāmbha*, there being another *Navarātrarārambhā* on *Āśvina śukla pratipad*.

Kārttika śukla 1 is *Balipratipad* or *Bali pūjā* and it is pūrvaviddha as to time.

Bhādrapada bahula 1 is *Mahālayārambha*.

Phālguna bahula 1 is *Vasantotsava*.

Dvitīyā (*Tithi II*).

Āshāḍa śukḷa 2 is *Ratha-yātra dvitīya* or *Rāma-rathotsava*.

Kārttika śukla 2 is *Yama dvitīyā* or *Bhrātṛi-dvitīyā* (because sisters make presents to brothers), and the time is afternoon.

The bahula dvitīyā in Āshāḍha, rāvaṇa, Bhādrapada and Āśvina is called *Asūnyaśayana-vrata* and the fast is broken at moonrise.

Tritīyā (*Tithi III*).

Chaitra śukḷa 3 is *Gaurī-tritīyā*; also *Matsa-jayantī* (afternoon); also *Manvādi* (forenoon).

Vaiśākha śukḷa 3 is *Kalpādi* (forenoon); *Tretāyugādi* (forenoon); *Akshaya-tritīyā* special, when combined with Wednesday and Nak. Rōhiṇī; time (forenoon); also *Parasu-rāma jayanti*.

Jyēshtha śukla 3 is *Rambhā-tritīyā*, when Bhavāni is worshipped at *pūrvaviddha*.

Śrāvaṇa śukla 3 is *Madhu-sravā* in Guzerat.

Śrāvaṇa bahula 3 is *Kajjalī-tritīyā*.

Bhādrapada śukla 3 is *Varāhā-jayantī* (afternoon); *Hariīālikā*, when Parvati is worshipped; *Manvādi* (forenoon). The tithi is by some called *Śivā*.

Phālguna bahula 3 is *Kalpādi* (afternoon).

Chaturthī (*Tithi IV*).

The śukla Chaturthī in every month is called *Ganeśa Chaturthī* or *Vināyaka Chaturthī*, the chief being *Māgha Chaturthī* (*Ganeśa jayantī*). It is celebrated at midday, *Tila*

Chaturthi is another name for Māgha śukla *chaturthī*. It is performed in the evening and is *pūrvaviddha*. *Kuṇḍa Chaturthī* is another name for the same festival.

Bhādrapada śukla chaturthī is special when it falls on Sunday or Tuesday.

Similarly the bahula chaturthī in every month is *Sankashṭachaturthī* and is a fast day for people in difficulties: the fast is broken at moonrise which is the time. This chaturthī is called *Angāraka Chaturthī* if it falls on Tuesday and continues till moonrise.

Śrāvaṇa bahula chaturthī is called, par excellence, *Rahula Chaturthī* and cows are then worshipped.

Panchamī (Tithi V).

Chaitra śukla 5 is *Śri panchamī* according to some: it is also *Kalpādi* (forenoon).

Śrāvaṇa śukla 5 is *Nāga panchamī* and snakes are then worshipped. If tithi begins within 6 ghaṭikas after sunrise of one day and ends within 6 ghaṭikas after sunrise on the next day, the tithi is celebrated on the former day and that is Nāgā panchamī.

Bhādrapada śukla 5 is *Rishi panchamī* (midday).

Āśvina śukla 5 is *Lalitā panchamī* or *Upānga-lalitā-vrata*, when Durgā is worshipped in the afternoon.

Mārgaśirsha śukla 5 is *Nāgapūja* or *Nāga panchamī*.

Māgha śukla 5 is *Vasanta panchamī*, when Rati and Kāma are worshipped in forenoon. *Śri panchamī* is another name.

Phālguna bahula 5 is *Ranga panchamī*, when colours are thrown about.

Shashṭī (Tithi VI).

Śrāvaṇa śukla 6 is *Kalki-Jayantī* (sunset), the last avatāra of Vishnu.

Śrāvaṇa bahula 6 is *Hala Shashṭhī*.

Bhādrapada śukla 6 is *Sūrya-Shashṭhī* or *Skanda-Shashṭhī*.

Bhādrapada bahula 6 is *Chandra Shashṭhī*. It is called *Kapila-Shashṭhi* when it combines on Tuesday with Nak. Rohini and Yoga Vyatīpāta and the sun is in Hasta.

Kārttika śukla 6 is special for feeding of Brahmans when it falls on Tuesday.

Mārgaśīrsha śukla 6 is *Skanda-Shaṣṭhī* or *Māhā-Shashṭhī; Champā-Shashṭhī*, when Śiva is worshipped as Khandoba. This tithi is special when it falls on Sunday or Tuesday and combines with Nakshatra Satabhishaj and Yoga Vaidhṛiti, or either of the two.

N.B.—Eye-table **S** shows that Nak. Satabishaj (No. 24) may concur with the tithi in a year in which some month before Mārgaśirsha is 'adhika'; but Yoga Vaidhṛiti (No. 27) can never concur with this tithi Eye-table v.

Saptamī (Tithi VII).

A *saptamī* on Tuesday, combined with Nak. Revatī (that is, by Eye-table, section **s** bahula 7 in Āshāḍha or Śukla 7 in Pausha or Māgha) is very auspicious. A *śukla saptamī*, falling on Sunday, is called *Vijaya*, and is special for donations. A *śukla saptamī*, joined with the first quarter of Nak. Hasta, is called *Bhadrā*. A *śukla saptamī*, coinciding with a Sankrānti, is called *Mahajayā*, which, for making donations, is superior even to an eclipse.

Vaiśākha śukla 7 is *Gangā-Saptamī* or *Gangotpatti* (birth of Gangā—midday).

Śrāvaṇa bahula 7 is *Sītalā-Saptamī* or *Sītalā-Vrata*, time *pūrvaviddha*.

Bhādrapada śukla 7 is called by some *Āparājitā*.

Āśvina śukla 7: about this tithi *Sarasvatī* is worshipped under Nakshatra Mūla.

Kārttika śukla 7 is *Kalpādi* (forenoon).

Mārgaśirsha śukla 7 is *Sūryavrata*.

Māgha śukla 7 is *Ratha-Saptamī* or *Mahā-Saptamī* (time, *aruṇodhaya*); *Manvādi* (forenoon.)

Ashṭamī (Tithi VIII).

An *Ashṭamī*, falling on Wednesday, is special and receives the name of *Budhāshṭamī*. The *Śukla Ashṭamī* in every month is sacred to Durgā or Annapūranā; while the *Bahula Ashṭami* in every month, called *Kālāshṭamī*, celebrated at pūrvaviddha, is sacred to Krishṇa.

Chaitra śukla 8 is *Bhavāni-utpatti*: when joined with Wednesday and Nak. Punarvasū; bathing on this tithi is special.

Śrāvaṇa bahula 8: *Janmāshṭamī*, *Krishṇāshṭamī* or *Krishṇa Jayanti* (midnight); special when combined with Nak. Rohinī; less so, when joined only to *Monday* or *Wednesday*; *Manvādi* (afternoon).

Bhādrapada śukla 8: *JyeshthāGāurī-pūjana-vrata*, when moon is in Nak. Jyesthā.

Bhādrapada bahula 8 : *Mahalakshmī vrata* (pūrvaviddhā) ; *Ashṭaka-śrāddha.*
Āśvina śukla 8 is *Mahāshṭamī* and is special when joined to Tuesday.
Kārttika śukla 8 is *Gopāshṭamī,* when cows are worshipped.
Kārttika bahula 8 is *Krishṇāshṭamī, Kāla-Bhairavāshṭamī,* or *Kāla-Bhairavajayantī.*
Mārgaśīrsha bahula 8 is *Ashṭaka-śrāddha* in the afternoon. The same is the case with bahula 8 in Pausha, Māgha and Phālguna.
Pausha śukla 8 is special when joined to Wednesday and Nak. Bharaṇi (Rōhiṇī or Ārdra, according to some).
Māgha śukla 8 is *Bhīshmāshṭamī* and is celebrated at midday.
Māgha bahula 8 is Birth of Sītā.

Navami (*Tithi IX*).

Chaitra śukla 9 is *Rāma-navamī* or *Rāma-jayantī,* at midday.
Bhādrapada śukla 9 is *Aduhkha-navamī.*
Āśvina śukla 9 is *Mahā-navamī* or *Durgā-navamī* : *Manvādi* (forenoon).
Kārttika śukla 9 is *Kritāyugādi* (forenoon).
Mārgaśīrsha śukla 9 is *Kalpādi* (forenoon).
Māgha bahula 9 is *Rāmadāśa navamī.*

Daśamī (*Tithi X*).

Jyēshtha śukla 10 is *Daśa-harā* (expiating ten sins) or *Gangāvatāra.*
Āshāḍa śukla 10 is *Manvādi* (forenoon).
Āśvina śukla 10 is *Vijayadaśamī* or *Daśara* (afternoon) ; special with Nak. Śrāvaṇa ; *Buddha-jayantī.*

Dvādaśī (*Tithi XII*).

The *Dvādaśī* is called *Mahā-dvādaśī* in the following circumstances :—

11th Tithi current at sunrise on two successive days : the next Dvādaśī is called Unmīlanī.
12th Do. do. : the Dvādaśī is called Vanjulī.
12th Tithi, to be followed by a full moon or a new moon tithi, current at two sunrises—Pakshavardhinī.
12th Tithi, joined with Nakshatra *Pushya,* is Jaya [*i.e.,* by Eye-table **s**, Bahula 12 in Bhād., or śukla 12 in Phālg. or Chait.]
Do. *Śrāvaṇa* is Vijaya [*i.e.,* by Eye-Table **s**, śukla 12 in Bhād., Asv., ; Bahula 12 in Phālg.].
Do. *Punarvasū* is Jayanti [*i.e.,* by Eye-table **s**, śukla 12 in Phālg. ; Bahula 12 in Śrāvaṇa].
Do. *Rohinī* is Papanasinī [*i.e.,* by Eye-table **s**, śukla 12 in Pausha, Māgha ; Bahula 12 in Āshāḍha].

Vaiśākha śukla 12, joined with Nak. *Hastā,* and Jupiter and Mars in *Simha,* sun in *Mesha,* is *Vyatīpāta.*
Āshāḍa śukla 12 is the commencement of *Chāturmāsya vrata.*
Śrāvaṇa śukla 12 is *Vishnoh-pavitrā-ropanam.*
Bhādrapada śukla 12 is *Vāmana jayantī* (midday) ; called Śrāvaṇa Dvādaśī, when joined with Nak. *Śrāvaṇa,* and specially, when further joined with *Wednesday.*
Āśvina bahula 12 is *Govatsa Dvādaśi* (evening).
Kārttika śukla 12 : (1) end of *Chāturmāsya vrata,* which began on same tithi in Āshādha.
(2) *Prabodhotsava* or *Utthāna dvādaśī* (preparation for waking Vishnu).
(3) *Tulasī vivāha* (marriage of Vishnu with the Tulasi plant).
(4) *Manvādī* (forenoon).
Māgha śukla 12 : *Bhīshma dvādaśī.*
Māgha bahula 12 : Tila dvādaśī or Vijaya, when combined with Nak. *Śrāvaṇa.*

[*N.B.*—This can only happen when a month previous to *Māgha* is Adhika—See Eye-table **s**.]

Trayōdasī (*Tithi XIII*).

Chaitra śukla 13 : *Madana trayodaśī* or *Ananga Pūjana vrata* (pūrvaviddha) : God of Love worshipped.

Bhādrapada bahula 13: (1) *Kaliyugādi* (afternoon).
(2) Māgha trayodaśī, when combined with Nak. *Maghā*.
(3) *Gajachaya*, when joined to Nak. *Maghā* and sun in *Hasta*.

Āśvina bahula 13: *Dhana trayōdaśī*, when money-lenders worship money.
Māgha śukla 13: *Kalpādi* (forenoon).

Phālguna bahula 13: (1) Vāruni, when joined with Nak. *Satabhishaj*.
(2) Mahāvāruni, when joined with Nak. *Satabhishaj* + *Saturday*.
(3) *Mahā-Mahā-Vāruni* when joined with Nak. *Satabhishaj* + *Saturday* + Yoga *Subha*.

[*N.B.*—Combinations (1) to (3) can happen only when Phalguni or some previous month is Adhika—See Eye-table **8**.]

Chaturdaśī (*Tithi XIV*).

Bahula Chaturdaśī in every month is *Sivarātri*.
Vaiśākha śukla 14: *Narasimha jayantī* (sunset): special when joined to Nak. Svāti + *Saturday*
Śrāvaṇa śukla 14: *Varalakshmī vrata*.
Bhādrapada śukla 14: *Ananta chaturdaśī*.
Āśvina bahula 14: *Naraka chaturdaśī* (moonrise), fasting to avoid *naraka* or hell.
Dīpavali (see *Āśvina amāvāsyā* below), may fall on this tithi if joined to Nak. Svāti.
Kārttika śukla 14: *Vaikuṇṭha chaturdaśī* (midnight).
Mārgaśīrsha śukla 14: *Pāshāna chaturdaśī*
Māgha bahula 14: *Mahā Śivarātri* (midnight, when Nak. Śrāvaṇa is current).
Special, when combined with *Sunday* or *Tuesday* and Yoga *Śiva*.

[*N.B.*—Yoga *Śiva* can combine with Śivarātri only when some month previous to Māgha is *Adhika*. See Eye-table **8**.]

Śukla Panchadaśī (*Tithi XV*): *śukla* 15 *or Pūrnimā, full moon.*

A śukla 15 or Pūrnimā is called *Somavatī* when it falls on Monday and is special for donations.
It is called Chūḍāmaṇi when it is *further* joined with a lunar eclipse.
Most pūrnimās receive special names, which are given below:—

Chaitra pūrnimā:—(1) *Manvādi* (forenoon).
(2) *Hanumat-jayantī*.
(3) Special for bathing, when combined with Sunday, Thursday or Saturday.

Vaiśākha pūrnimā:—*Kūrma jayantī* (late afternoon).

Jyēshṭha pūrnimā:—(1) *Manvādi* (forenoon).
(2) *Vata pūrnimā* or *Vata Sāvitrī* (pūrvaviddha).
(3) *Maha-jyaishṭhī*, when moon and Jupiter are in Nak. *Jyēshṭhā* and sun in Rohiṇī.

Āshāḍa pūrnimā:—(1) *Manvādi* (forenoon).
(2) *Śivaśayanotsava*, or *Kokilā-vrata* or *Vyāsapūjā*.

Śrāvaṇa pūrnimā:—(1) *Rig-yajur-Śrāvaṇa* (*i.e.*, Śrāvaṇa for followers of Rig and Yajur Vedas).
(2) *Rakshābandhana* (tying a string round the arm) or *Rakipūrnimā* or *Nārali pūrnimā* (throwing coconuts into the sea).
(3) *Hayagrīva Jayantī*.

Bhādrapada pūrnimā:—*Praushṭhapādi pūrnimā* or *śrāddha*.

Āśvina pūrnimā:—(1) *Kojāgari pūrnimā* or *Kojāgara vrata* (midnight). Lakshmi and Indra worshipped; games of chance.
(2) *Navānna pūrnimā*, when new grain is cooked.

Kārttika pūrnimā:—(1) *Manvādi* (forenoon).
(2) *Chāturmāsya vrata* ends.
(3) *Tripurī pūrnimā* or *tripurotsava*.
(4) Special when joined to Nak. Kṛittikā.
(5) *Mahā kārttika*, when joined to Nak. *Rōhiṇī*; or when moon and Jupiter are both in Nak. *Kṛittikā*.

(6) *Padmakayoga*, when moon is in Nak. *Kṛittikā* and sun in Nak. *Viśākha*.
(7) Kṛittika festival in Southern India.

Margaśīrsha Pūrnimā :—(1) *Dattā treya* or *Datta-jayantī* (evening).
(2) Special for donations of salt, when joined to Nak. Mṛigaśīrâs.
(3) Ārdrā festival in honour of Śiva at Chidambaram and elsewhere. Śiva, in his incarnation of Naṭeśa, is said to have been born on Mārgaśīrsha Pūrṇimā under the Nakshatra *Ārdrā* : the combination could take place only when some month previous to Mārgaśīrsha was *adhika*. (See Eye-table s.)

Māgha Pūrṇimā Maha-Maghi, when Moon and Jupiter are both in Nak. Māghā.

Phālguna pūrṇimā : (1) *Manvādi* (forenoon).
(2) *Holikā* or *Hutāśani pūrnimā* (evening).
(3) *Kāman Paṇḍigai* (in South India destruction of the Indian Cupid by Śiva).

Bahula Pañchadaśī (*Tithi XV*): *Amāvāsyā—New Moon.*

A solar eclipse on Sunday is Chūḍāmaṇi, and is special for donations.

Amāvāsyā at the end of Śrāvaṇa and beginning of Bhādrapada : *Pithori* or *Kusotpātinī*.
Amāvāsyā at the end of Bhādrapada and beginning of Āśvina : *Sarvapitri* or *Mahālaya Amāvāsyā* : special when sun and moon are both in Nak. *Hasta*.
Amāvāsyā at the end of Āśvina and beginning of Kārttika is *Dīpāvali*, with previous and following tithis : that on which Nak. is *Svāti* being the special day.
Amāvāsyā at the end of Pausha and beginning of Māgha (1) Ardhodaya, when joined with *Sunday* in day time + Nak. *Śrāvaṇa* + Yoga Vyatīpāta.

[*N.B.*—This can only happen when some month previous to Māgha is Adhika.]

Amāvāsyā at the end of Pausha and beginning of Māgha (2) Mahodaya when any one of these special features is wanting.

Amāvāsyā at the end of Māgha and beginning of Phālguṇa: (1) Dvāparayugādi (afternoon).
(2) Special for Śrāddhas, when joined with Nak. *Śatabhishaj* or Nak. *Dhanishṭha*.

Amāvāsyā at the end of Phālguna and beginning of Chaitra : *Manvādi* (afternoon).

N.B.—Miss Underhill's *Hindu Religious Year* (1921—*Religious Life of India Series*) contains a full popular account of Hindu religious fasts, feasts and festivals.

SECTION XX.—*The Muhammadan year.*

159. The Muhammadan era, commonly called *Hejra* or *Hijra*, is dated from Friday, 16 July, A.D. 622, the day of the flight of the Prophet.

The Muhammadan calendar is not luni-solar like the Indian calendar, but strictly lunar. The length of the synodical month according to the Muhammadan calendar is 29 days 12 hours 44 minutes. The three seconds reckoned in addition in the Hindu calendar are neglected in the Muhammadan. The months are alternately 29 and 30 days long, which, again, if carried out uniformly, would result in an error of 44 minutes per month, which, in 360 months, or 30 lunar years, would amount to $\frac{360 \times 44}{60 \times 24} = 11$ days. These 11 days are accordingly added to the last month of the calendar in 11 out of every 30 years, and the year containing an extra day is, from analogy, sometimes called a leap year.

160. Every 30 years form a cycle in the Muhammadan calendar. The years which have 355 days, instead of 354, are in some countries the 2nd, 5th, 7th, 10th, 13th, 15th, 18th, 21st, 24th, 26th and 29th. Elsewhere, the 2nd, 5th, 8th, 10th, 13th, 15th, 19th, 21st, 24th, 27th and 29th are kept as leap years.

It will be noticed that the difference of usage is as regards the 8th, 19th and 27th years in each cycle. The generality of authorities (including the Encyclopædia Britannica) have adopted the 7th, 18th and 28th years of each cycle as leap years and the Ephemeris follows this usage.

161. All the books that deal with the Muhammadan calendar mention the above difference of usage, but they do not give the reason of it. The reason is, however, not far to seek.

If we write down the accumulated error which remains at the end of each year by reason of the neglect to take account of 44 minutes and which was adverted to in the first section of this chapter, we obtain the following result under the system of reckoning the 8th, 19th and 27th as leap years:—

Year.	Error.	How error is corrected by leap year.
1st year,	8 hrs. 48′	
2nd year,	17 hrs. 36′	1st day added by leap year.
3rd year,	2 hrs. 24′	
4th year,	11 hrs. 12′	
5th year,	20 hrs. 0′	2nd day added by leap year.
6th year,	4 hrs. 48′	
7th year,	13 hrs. 36′	
8th year,	22 hrs. 24′	3rd day added by leap year.
9th year,	7 hrs. 12′	
10th year,	16 hrs. 0′	4th day added by leap year.
11th year,	0 hrs. 48′	
12th year,	9 hrs. 36′	
13th year,	18 hrs. 24′	5th day added by leap year.
14th year,	3 hrs. 12′	
15th year,	12 hrs. 0′	
16th year,	20 hrs. 48′	6th day added by leap year.
17th year,	5 hrs. 36′	
18th year,	14 hrs. 24′	
19th year,	23 hrs. 12′	7th day added by leap year.
20th year,	8 hrs. 0′	
21st year,	16 hrs. 48′	8th day added by leap year.
22nd year,	1 hr. 36′	
23rd year,	10 hrs. 24′	
24th year,	19 hrs. 12′	9th day added by leap year.
25th year,	4 hrs. 0′	
26th year,	12 hrs. 48′	
27th year,	21 hrs. 36′	10th day added by leap year.
28th year,	6 hrs. 24′	
29th year,	15 hrs. 12′	11th day added by leap year.
30th year,	*Nil.*	

Those who observe the 8th, 19th and 27th years as leap years add a day by means of a leap year in order to avoid the error accumulating to more than 1 *day* at the end of the following year; while those that observe the 7th, 18th and 26th as leap years add a day by means of a leap year in order to avoid the error accumulating to more than *half a day* at the end of the following year.

162. The months and the number of days in each are as follows:—

Month.	Number of days.	Day of commencement reckoning from beginning of year.	Month.	Number of days.	Day of commencement reckoning from beginning of year.
1. Muḥarram	30	...	7. Rajab	30	177
2. Ṣafar	29	30	8. Sha'bān	29	207
3. Rabi-ul-awwal	30	59	9 Ramazān	30	236
4. Rabi-ul-ākhir or Rabi-us-sani	29	89	10. Shawwāl	29	266
5. Jamāda'l-awwal ...	30	118	11. Zi-l-ka'da	30	295
6. Jamāda'l-akhir or Jumad-us-sani ...	29	148	12. Zi-l-hijja	29	325
			Do. (when intercalary) ...	30	

All readers are familiar with the names of two of the Muhammadan months, *Muharram* and *Ramazān*, and all are equally familiar with the fact (due to the strictly lunar character of the year) that Muḥarram is liable to occur at any part of the solar year.

163. The Muhammadan day, like the Jewish, is reckoned from sunset to sunset, and the first day of Muḥarram is that on which the moon is for the first time visible at sunset after new moon. This is called the heliacal rising of the moon. Our readers are familiar with the Muhammadan usage of observing the heliacal rising of the moon from eminences of any sort, and passing word as soon as she is seen, so as to give notice that Muḥarram has commenced.

To the reader who is by this time quite at home among tithis and their ending moments, we would quote the following rule from Messrs. SEWELL & DIKSHIT'S *Indian Calendar*:—

"It is well to note that where the first tithi of a month ends not less than 5 ghaṭikas before sunset, the heliacal rising of the moon will probably take place on the same evening; but where the first tithi ends 5 ghaṭikas or more after sunset, the heliacal rising will probably not take place till the following evening. When the first tithi ends within these two periods between 5 ghaṭikas before and 5 ghaṭikas after sunset, the day of the heliacal rising can only be ascertained by elaborate calculations."

Where so much depends upon sunset and moonrise, it is obvious that places with different longitudes and latitudes will often not agree in regard to the exact date of commencement of the Muhammadan year.

CHAPTER IV.—CONSTRUCTION OF TABLES.

SECTION i.—*Theory of anomalies and equations of the centre.*

164. The uses of the Eye-table, sections **e** to **i**, will be sufficiently obvious from examples already worked out. We may therefore give in this place in popular language a theory of anomalies and their equations.

165. From the fact that the orbit of the moon as well as that of the earth is elliptical, not circular, it follows that the motions of these bodies cannot be uniform from day to day or from hour to hour. This irregularity is called the *eccentricity* of the orbit and the correction to be applied on this account is called the equation of the centre.

166. The following extract from Professor Jacobi's Table in Vol. I of *Epigraphia Indica* will serve to introduce the reader to the general theory of solar and lunar anomalies, and it will also show how the material furnished by the siddhāntas has been worked into sections **e** to **i** of the Eye-table in the present work. Professor Jacobi's tables are reproduced more fully at pages 79 to 81 below. See explanation prefixed to these tables on pages 75 to 77 below.

Sūrya siddhānta—

☾'s eqn. + ; ☉'s eqn. −				☾'s eqn. − ; ☉'s eqn. +				Moon's equation of the centre.			Sun's eqn. of the centre.		
Deg.	Min.	Deg.	Min.	Deg.	Min.	Deg.	Min.	Deg.	Min.	Sec.	Deg.	Min.	Sec.
0	0	180	0	180	0	360	0	0	0	0	0	0	0
30	0	150	0	210	0	330	0	2	32	0	1	6	3
60	0	120	0	240	0	300	0	4	22	30	1	53	26
90	0	90	0	270	0	270	0	5	2	46	2	10	31

167. Let us try to interpret in detail the meaning of this table. We are supposed to measure the moon's rate of progress, beginning from perigee, the point when she is nearest the earth, and at every step we must distinguish the moon's mean position, i.e., the position which she would have attained at a uniform rate of motion equal to the mean, and the actual position which she attains on account of the eccentricity of her orbit.

168. The mean and actual positions are the same at 0° or 360°, i.e., at perigee and at 180°, i.e., at apogee.

When the moon's mean position is 30° from perigee, her actual position has advanced by 2 degrees 32 minutes.

When her mean position ought to be 60°, we find her actually at 64° 22′ 30″ from perigee.

When her mean position ought to be 90°, that is half way between perigee and apogee, she is actually 95° 2′ 46″ from perigee.

From this point she begins to move more slowly, though her actual position is still in advance of the mean.

At 120° from perigee, she is 4° 22′ in advance of the mean position, that is, exactly as she was at mean 60°.

At 150° from perigee she is only 2° 32′ in advance of the mean position.

From 180° onwards she begins to slow down, and when she ought to be 210° from perigee, or 30° from apogee, we find she has reached only 210° *minus* 2° 32′ or 207° 28′. When she ought to be 270° from perigee, she is only 270° *minus* 5° 2′ 46″ or 264° 57′ 14″

From 270° onwards she begins to move quicker, though she is still behind her mean position. At 300° she is behind by 4° 22′ 30″ and at 330° she is behind her mean position by only 2° 32′ and at 360° or at perigee she is even with her mean position.

169. In like manner we might trace the sun's mean and actual positions from perigee through apogee back to perigee, using the figures in the last column of the above table, from which we see that the maximum equation of the centre for the sun is 2° 10′ 31″.

170. In our tables (except under Planetary Table IV) we do not refer to the sun's or moon's position by degrees, but by days, which is more readily intelligible and handier for purposes of calculation. Our Eye-table, sections **e** to **i**, is simply the result of a careful expansion of the tables at pages 79 to 81 below from which the above figures have been extracted.

171. It is now necessary to explain how the *anomaly* and equation in degrees are converted into days and fractions of a day. Let us suppose the sun and the moon to move in the same plane and in circular orbits, describing equal spaces in equal times. Let AB, BC, CD be the mean spaces described by the sun in three successive tithis, and let AM, MN, NP be the corresponding mean spaces described by the moon in the same tithis. If there were no irregularity or eccentricity in the sun's and moon's motions, the first tithi would be the time taken by the moon to gain 12°, that is, the arc BM over the sun; similarly the second and third tithis would be the periods in which the moon gains (MN *minus* BC) and (NP *minus* CD) over the sun. But owing to the eccentricity of their orbits we will suppose the sun to be at B′ (actual position) when he ought to be at B (mean position) and the moon to be at M′ (actual position) when she ought to be at M (mean position). Then in the period of a mean tithi (·9843 day) the moon gains over the sun the arc B′M′ but our tithi is the period during which the moon actually gains over the sun 12°, i.e., we must cut off from B′M′ an arc equal to BM and determine the time during which that length is gained by the moon. Our problem would be solved if we knew the time during which B′M′ *minus* BM was gained by the moon.



172. Now B′M′ *minus* BM = MM′ *minus* BB′. The time during which MM′ — BB′ is gained, is evidently the time during which MM′ is gained *minus* the time during which BB′ is gained. The times during which MM′ and BB′ are respectively gained are obtained by turning MM′ and BB′ into days at the rate of 29·53058 days to 360°. For nakshatra and yoga equations other scales, viz., 27·32166 days and 25·4202 days respectively to 360° were used for converting degrees into days. For the moon's anomaly, the scale 360° = 27·5546 days was used.

173. As the equation for the sun as well as the equation for the moon is sometimes positive and sometimes negative, and for *tithis* we have to take the *difference* between the two equations, some confusion would result from our having to change signs so often. Therefore the sun's equations are tabulated, as in the extract given above, with the signs *reversed*. That is why the sun's eccentricity, starting from perigee, is shown in the table extracted above as negative whereas it is really positive.

174. The reader will also observe that the moon's equation in the above table is, as it should be, positive between perigee and apogee, whereas in Eye-table **e** to **g** it is negative for the same period. The reason is that when the moon does in a given time *more* than the mean space, this is equivalent to a given space being done in *less* than mean time. This is why in the Eye-table, which derives equations of time from equations of space, the signs of space-equations are reversed. In the case of the sun's equations, a double reversion of signs takes place, first a reversion in order to make the operation of combining the sun's and moon's equations always an addition, and secondly a reversion in order to derive equations of time from equations of space. As a final result, the sun's equation of time is shown in Eye-table **h** as positive after perigee and negative after apogee. A third reversion takes place in calculating sunrise, where we have to derive equations of space from equations of time.

175. In calculating tithis, all we have to do, is to sum up the equations of the sun and the moon according to the Eye-table whether they are positive or negative. Before taking the moon's equation, however, we in practice add to or deduct from the moon's anomaly the sun's equation and we determine the equations for the net moon's anomaly. The reason is that when the effect of the sun's anomaly is to diminish or increase the mean time that would be necessary for a tithi, it is necessary to take the moon's anomalies for the altered mean time.

176. Conversely, in calculating *yogas*, where we have to take the sum of the proper anomalistic equations of the sun and the moon, our yoga equations in the Eye-table have had to be suitably altered as to their signs.

177. For *nakshatras*, we have to convert the moon's eccentricity, in other words her equation of the centre, into days at the rate of the moon's sidereal motion, i.e., 360° for 27·32166 days.

178. The sun's anomaly in the Eye-tables (sections **h** and **i**) is expressed, not in days of the *anomalistic* year, but as days of the *solar* year, and this is done for convenience of use. The length of the modern anomalistic year is 365·2596 days while that of the Hindu sidereal year is 365·2587 days. There is no practical error in adopting, as the Indian siddhāntīs have done, an identical period for the anomalistic and solar sidereal years. The modern anomalistic lunar month is, like the Hindu anomalistic month, 27·5546 days. In converting degrees of anomaly into days we, therefore, put—

Sun's anomaly: 360° = 365·258756481 days.
Moon's anomaly: 360° = 27·45459999 days.

179. The above theory of anomalies and equations is subject to an important variation in practice. Supposing a mean tithi is accomplished at A days of the solar year, when the moon's anomaly is B days, then, if the ☉'s equation for A days is—a, this means that the tithi would be accomplished (supposing for the moment that the ☾'s anomaly had no influence) in $A - a$ days of the solar year, at a moment when the moon's anomaly would be $B—a$. Now we proceed to determine the influence of this moon's anomaly $B—a$ and find the moon's equation to be, let us suppose, $—b$. We then put down, as the actual ending moment of the tithi, $A—a—b$ days of the solar year.

180. Strictly speaking, we ought to take (1) the sun's equation for $A + b + a$ days of the solar year, where b is the equation (positive or negative) of the moon for anomaly B, and a is the ☉'s equation, positive or negative, for A days of the solar year, (2) the moon's equation for anomaly of $B + a$ days, and then add the equation so found. But in practice this refinement is not necessary for the sun's equation, since the maximum value of $b + a$ is (·4138 + ·1784 =) ·5922 day, and the maximum variation of the sun's equation for this period is about ·0018 day or 6 palas only. We may note, however, that in the test example, worked by Prof. Jacobi for Āshāḍha śukḷa 12, K.Y. 3585, a difference of 4 palas does occur between his method and Mr. Dikshit's, and the learned Professor rightly surmises in a footnote (*Ep. Ind.*, Vol. I, p. 430) that the difference must be due to an abridgment in the Hindu method. We now see what the abridgment consists in.

Section ii.—*Tables for converting space into time.*

181. In the body of the present work as well as in the connected tables measures of time alone are used, and measures of space (i.e., *degrees* of celestial longitude, *degrees* of mean anomaly of the sun and moon, etc.), have been generally excluded. This is the principle known as Largeteau's method, which was first applied to Indian astronomical computation by Professor Jacobi in 1888. Messrs. Sewell and Dikshit have applied the same principle in their "*Indian Calendar*" (1896). The present method is founded on Largeteau's principle, but differs materially from it as well as all previous applications of it in one important respect. Instead of using Largeteau's method to discover how much *space* has been accomplished at a particular moment of time, the present writer has used an adaptation of the method to discover the *moment of time* at which a particular extent of space has been accomplished. Thus, instead of determining the expired portion of a tithi, corresponding to a given moment of time (i.e., generally to mean sunrise on a particular day), as is done by Messrs. Jacobi and Sewell, and then calculating the unexpired portion of the tithi by means of successive approximations, the present writer investigates, directly and once for all, the *ending moment of a tithi*, the very thing required by Indian usage. Not only does this procedure abridge the labour of ascertaining ending moments of tithis, nakshatras and yogas, but it furnishes a very ready criterion for testing whether a month is *adhika* or *kshaya*, whether two tithis ended on the same day, etc.

182. The principles upon which space was converted into time for the purposes of the present work are set forth in the following paragraphs.

183. The principal measure of space, the distance of the moon from the sun, was converted into days in the ratio of 29·530587946 days to 360° in the case of the Sūrya siddhānta, 29·5305925 days to 360° in the case of the Ārya siddhānta, and 29·530582052 days in the case of the Brahma siddhānta and Siddhānta Śiromaṇi.

184. The increase of the moon's age, according to the *Sūrya siddhānta*, for each solar year is according to the above rate of conversion, 10·891701134 days.

Instead of reckoning the increase of the moon's age, however, the present method reckons directly the *retardation in the date of appearance of the first new moon* in each solar year, for which purpose it is, of course, necessary to deduct 10·891701134 days from 29·530587946 days: result, 18·638886812 days. This, then, is the number of days by which the appearance of the first new moon is retarded each year, and the first thing to do every year is to calculate the interval of retardation for that year. The interval (if we take the retardation for one year) will, *ipso facto*, be the date of appearance of the first or Vaisākha new moon in solar year 1 of Kaliyuga (expired). From this date all other mean new moons for that or any subsequent solar year may be found by the successive addition of multiples of 29·53059 days; and the mean ending moment of every tithi is given by the addition of the tithi equivalent in days (according to the Eye-table section **d**) to the date of mean new moon. Precisely the same method was followed for the Ārya siddhānta, Lalla's corrections being introduced at the appropriate date, and for the Brahma siddhānta and Siddhānta Śiromaṇi.

185. The mean anomaly, in the case of the moon as well as that of the sun, was reckoned from perigee, as in Professor Jacobi's article in the *Indian Antiquary* (1883), and not from apogee, as in his articles in Volumes I and II of *Epigraphia Indica*. For the purpose of the Eye-table, the moon's mean anomaly was converted into days in the ratio of 27·554599899 days to 360° in the case of the Sūrya siddhānta, and of 27·554566936 days to 360° in the case of the Ārya siddhānta. The increase of the moon's mean anomaly for a single solar year is thus:—

Sūrya siddhānta, 7·048957797 days.
Ārya siddhānta, 7·049310381 days.

The anomaly of the moon at the first moment of Kaliyuga was taken as 90° from perigee, that being the figure according to all the authorities. From the year A.D. 1600, the corrected period of the anomalistic month (27·55459797 days) has been adopted for Sūrya siddhānta calculations.

186. The moon's mean anomaly, as entered in the Eye-table, corresponds to the *tithi* or *space* accomplished, while the equation is the addition to or deduction from the tithi, to be made in order to arrive at the *time* or *ending moment* of the tithi. Consequently, the equation in time was in every case added to or deducted from the mean anomaly, after the conversion of the anomaly in degrees into anomaly in days. The same procedure was adopted in regard to the sun's equation. This procedure is explained more fully in the next section.

Section iii.—*Construction of sun's and moon's anomaly tables, i.e., of Eye-table, sections* **e** *to* **i**.

187. The accompanying three tables show, in detail, the different processes employed in the computation of the sun's and moon's anomaly and equation tables in Eye-table, sections **e** to **i**.

188. Table I shows (1) how the 0 day of the sidereal-anomalistic year was arrived at for the Eye-table, sections **h** and **i**; (2) corrections to be applied at different epochs when using Eye-tables, sections **h** and **i**; (3) Śōdhya in degrees and in days at different epochs under Brahma siddhānta, Siddhānta Śiromaṇi and Sūrya siddhānta.

189. Special Table I.—The sun's anomaly at the moment of commencement of the mean solar year (columns 2, 8 and 14) was taken from Professor Jacobi's tables in *Ep. Ind.*, Vol. I, and the śōdhya in degrees entered in the columns next to the above were obtained by conversion from Dr. Schram's figures quoted in Mr. Sewell's *Indian Chronography*. By subtracting the śōdhya from the anomaly at 0 day, mean solar year, we obtain the sun's anomaly at the commencement of the true solar year, namely, at *Mēsha sankrānti*, which is entered in columns 4, 10 and 16 of Special Table I. The anomaly in degrees being converted into solar days at the rate of 1·0146 days for each degree (this ratio is the same for all siddhāntas), and the result being subtracted from the total number of days in the year, 365·26 days (for all siddhāntas), we have the 0 day of the sidereal-anomalistic year for the purpose of the Eye-table, sections **h** and **i**. In the Ārya siddhānta alone the sidereal year is absolutely identical with the anomalistic year and the 0 day is 81·29 days of the solar year always. In the other siddhāntas, the anomalistic year is slightly different from the sidereal year and this is shown by the variation

of the śōdhya from century to century. Nevertheless for the construction of anomaly tables the 0 day of a particular epoch has to be selected. It will be seen from Table I, columns 7, 13 and 19, that the 0 day shown in the Eye-table pertaining to the several siddhāntas is correct for the following respective epochs :—

Brahma siddhānta, K.Y. 3900 to 4000.
Siddhānta Śiromaṇi, *Circa* K.Y. 550.
Súrya siddhānta, K.Y. 3600 to 3800.

190. The Brahma siddhānta could not have been brought into use much before the eighth century A.D., and the 0 day of the Eye-tables, sections **h** and **i** is correct for that century. The corrections to be applied for subsequent centuries, up to a maximum of—·04, may be neglected, since the sun's anomalistic equation undergoes hardly any change in the first three decimal places for ·04 of a day. Similar observations apply to the Sūrya siddhānta anomaly tables which may be used for any epoch in the epigraphical period without correction.

191. It is hardly worth while to construct separate anomaly tables for the Siddhānta Śiromaṇi which was intended by its author Bhāskarachārya merely as a recension of the earlier Brahma siddhānta ; but it will be seen from column 9 of Table I that the śōdhya changes rapidly from century to century, and the period for which the Brahma siddhānta Eye-tables, sections **h** and **i** would be quite correct for the Siddhānta Śiromaṇi, is somewhere between K.Y. 500 and K.Y. 1000, i.e., *Circa* 2600 B.C. During the epigraphical period in particular, and remembering that the Siddhānta Śiromaṇi could not have been in use earlier than the twelfth century A.D., when it was composed, a correction from 1 to 1·25 days has to be applied when using the Brahma siddhānta, Eye-table **h** and **i**, for the Siddhānta Śiromaṇi. Thus in calculating a tithi or a yoga by the Siddhānta Śiromaṇi in, say, the fourteenth century A.D. each of the sun's anomalies in days, entered in the Eye-table **h** and **i** should be read as if it was 1·18 days less. In other words, supposing the equation by the Siddhānta Śiromaṇi for a sun's anomaly of 90 days was required, we should take from the Brahma siddhānta Eye-table **h** or **i** as the case may be, the equation corresponding to a sun's anomaly of 90 minus 1·18 days, or 88·82 days. For practical purposes it is enough if one day is deducted from all the sun's anomalies in Brahma siddhānta, Eye-table **h** and **i** when applying the Siddhānta Śiromaṇi. It will be seen that in working the illustrative problem appended to the Brahma siddhānta Eye-table, we deduct ·90 of a day from the sun's anomaly for a date in A.D. 484 ; the case is purely supposititious, however, since the Siddhānta Śiromaṇi did not come into use till some eight centuries later.

192. We may now consider *Special Table II* which shows the process of converting the sun's anomalies and equations in degrees into anomalies and equations in days of the solar year and fractions of a day. The entries in columns 1 to 4, 9, 19 and 34 are taken from Professor Jacobi's table in Vol. I of *Ep. Indica*, showing the sun's anomaly and equation in 24 stages by the different siddhāntas. In the transformation of these figures into Eye-table, sections **h** and **i**, the following stages may be noted :—

(1) Before the stages of the anomaly could be converted into days of the solar year, the first step, namely the determination of 0 day of the sidereal-anomalistic year, 80·23 days for Brahma siddhānta and Siddhānta Śiromaṇi, 80·55 days for the Sūrya siddhānta and 81·29 days for the first Ārya siddhānta (columns 5, 15 and 30 of Table II) was effected in the manner already explained under Special Table I. The subsequent stages of anomalies entered in columns 5 to 8, 15 to 18, and 30 to 33 were arrived at by adding successively the day equivalent of 3·75 degrees, the unit stage in Professor Jacobi's tables.

(2) The conversion of the equations in columns 9, 19 and 34 of Special Table II, which are in degrees, into days was effected at the rate of 29·53059 days for 360 degrees for tithi equations and 25·4202 days for 360 degrees for yoga equations.

(3) The sun's anomaly in days, already determined, was corrected by including or excluding the corresponding equations, as each case might require ; this process requires some explanation and somewhat careful reflection on the part of the reader who makes acquaintance with it for the first time. Some of the observations below can be more easily understood with reference to the moon than the sun, but the method of reasoning is the same in both cases.

193. To construct an Indian Calendar of tithis and nakshatras, we have to pass at every step from *the mean phase of a moment* to the *moment of the actual phase*, and *from the anomaly at the mean ending moment of a tithi, or yoga, to the actual ending moment of the tithi or yoga*, and we have to accomplish this passage, in other words, to bridge the interval, by means of an equation. The "phase of a moment," say, the phase accomplished by the moon at sunrise on a particular day, can be calculated, as is done by Professor Jacobi, by ascertaining, first the mean phase accomplished at that moment, and then the fraction of the phase resulting from the addition of the acceleration in degrees (let us call it A) or retardation in degrees (which we might call R), corresponding to the mean anomaly of that moment. For most purposes this is enough, because it will enable us to determine approximately the time in which the remainder of the phase will be accomplished, and all we want generally is to find out on what day between sunrise and sunrise a particular tithi or phase actually ended.

194. But we may also want to know when the tithi actually ended, which knowledge is necessary (1) when a tithi is likely to have ended about the moment of sunrise, and we want to know definitely whether it preceded or followed sunrise, for in either case the day of the tithi would have a different vāra or week day, (2) when we want to know the limits of an adhika month or of a kshaya month. Every Indian panchānga, therefore, always gives the ending moment of a tithi in ghaṭikas and palas; i.e., in 4 decimal places of a day, and our aim is to devise a method which will give us this result.

195. We know the moment of every mean phase just as we know the mean phase of every moment; we know also for any moment, which we may call **n** the mean phase or the mean event of some other kind which must belong to it and also the acceleration in time (— **a**) or retardation in time (+ **r**), belonging to the mean anomaly of that moment. For instance, we know that at a moment **n** the moon attains a mean elongation of 96°, in other words that **n** is the mean ending moment of the 8th tithi: we also know what the mean anomaly, which we may call M, of that moment is; lastly, we know that the acceleration belonging to that moment is + A in degrees or that the retardation belonging to that moment is — R in degrees, so that the actual place of the moon at that moment **n** is, 96° + A, or 96° — R. But what we wish to know further for the purposes of Indian astronomy is the moment, let us call it **x**, when the moon's mean elongation plus the acceleration or retardation belonging to that moment will together exactly equal 96°.

196. The contents of the first ten columns of Special Tables II and III (pages 79, 81 below) which are all the material we have in Prof. Jacobi's and other existing tables will not enable us to solve this problem, and we shall have to attack it in a somewhat indirect manner, as shown in the remaining columns of Special Tables II and III. In doing so, we lay down, as our fundamental proposition, *that the mean anomaly in days of the moment of an actual phase* (which anomaly we may denote by **m**) + the *acceleration in fraction of a day, appropriate to that phase* (which we may call **a**) = *mean anomaly in days of the moment of the mean phase*. A little reflection will convince the reader that the same equation serves as a bridge (1) between the mean ending moment and the actual ending moment of a tithi and (2) between the mean anomaly at the mean ending moment and the mean anomaly at the actual ending moment of a tithi. We shall also use this identity. We proceed to arrange according to the above proposition and the above identity the mean anomalies noted in columns 5 to 8 of Special Table III and the accelerations noted in column 10 of the same table. The formula for retardations is exactly similar, namely, *the mean anomaly of the moment of an actual phase minus the retardation appropriate to that phase*, or **m** — **r** = *mean anomaly of the moment of the mean phase (in days)*.

When the mean anomaly of the moon at the moment of an actual phase or tithi is ·287 day (column 5), this quantity *plus* the acceleration due to that anomaly, ·0271 day (column 10), or ·3141 day, is the mean anomaly at the moment of the corresponding mean phase or tithi. This means that when the mean anomaly at the mean ending moment of a tithi is ·3141 day, the equation, i.e., the time difference between the ending moments of the mean and the actual tithi, is ·0271 day. We proceed to tabulate other results in the same way with pairs of figures of which one is taken from column 10 and the other from columns 5 to 8.

(1)	For a mean anomaly, at mean tithi end, of	·287	day	+ ·0271	day or	·314	day, the equation is	− ·0271	day.
(2)	,,	,,	3·444	days	+ ·2932	,,	3·737	days	,,	− ·2932 ,,
(3)	,,	,,	6·889	,,	+ ·4139	,,	7·303	,,	,,	− ·4139 ,,
(4)	,,	,,	10·633	,,	+ ·2932	,,	10·925	,,	,,	− ·2932 ,,
(5)	,,	,,	13·490	,,	+ ·0271	,,	13·517	,,	,,	− ·0271 ,,
(6)	,,	,,	14·064	,,	− ·0271	,,	14 037	,,	,,	+ ·0271 ,,
(7)	,,	,,	17·222	,,	− ·2932	,,	16·929	,,	,,	+ ·2932 ,,
(8)	,,	,,	24·110	,,	− ·2932	,,	23·817	,,	,,	+ ·2932 ,,

Cases (1) to (4) illustrate acceleration (**a**), while cases (5) to (8) illustrate retardation (**r**).

These results are made use of in columns 11 to 14 of Special Table III.

197. In the same manner columns 5 to 8 of Special Sun-Table II, page 79 below, for Brahma siddhānta and Siddhānta Śiromaṇi, are corrected in columns 11 to 14 for tithi equations; columns 15 to 18 (Sūrya siddhānta) headed **m** are corrected in columns 22 to 25 for tithi equations, and become **m + a**, **m − r** and are corrected again in columns 26 to 29 for yoga equations and then become **m − r**, **m + a**; and lastly columns 30 to 33 (first Ārya siddhānta), headed **m** are corrected in columns 36 to 39 for tithi equation and become **m + a**, **m − r**. That is, the equations in column 10 are added to the uncorrected anomalies in columns 5 and 6 in order to form the corrected anomalies in columns 11 and 12; and the same equations in column 10 are subtracted from the uncorrected anomalies in columns 7 and 8 in order to form the corrected anomalies in columns 13 and 14 for tithi equations. Exactly the same processes of addition and subtraction account for the transformation of columns 15 to 18 into columns 22 to 25 (Sūrya siddhānta) and that of columns 30 to 33 into columns 36 to 39 (First Ārya siddhānta). The case for addition becomes one for subtraction, and *vice versa*, in the case of yogas; as an example of this is shown the transformation of the uncorrected anomalies in columns 15 to 18 into corrected anomalies for yoga equations by the sūrya siddhānta in columns 30 to 33.

The symbols M, **m**, A, **a**, R, **r**, in the senses above explained, are retained in the headings of Special Tables II and III on pages 79 to 81 below, in order that the reader may be enabled to follow easily the different steps of the process. It will be seen that the equations in degrees in column 9 of both tables and in other similar columns are called "A or R" and the equations, as decimals of a day, are called "**− a** or **+ r**," because (1) the same quantities, when positive, are called A and **r** respectively, and when negative, they are called R and **a** respectively, that is, an acceleration in space is a decrease of time: while a retardation in space means an increase of time in *passing from the mean to the actual ending moment of a tithi or phase*: and (2) the combination **m + a** means that when an anomaly in days is **m + a**, the corresponding equation is **− a**; similarly, when the anomaly in days **m − r**, the corresponding equation is **+ r**.

From the 24 stages entering into various columns in Special Tables II and III and called "anomalies corrected for equations," are obtained; by interpolation, the different stages required for Eye-tables, sections **e** to **i**, pages 171 to 194 below. For example, in column 11 of Special Table II (page 79), the equation corresponding to a sun's anomaly of 123·20 days is −·1177 days and the equation corresponding to a sun's anomaly of 127·02 days is −·1262 day. From these anomalies and equations we derive by proportional parts,

⊙'s anomaly.		Equation.
123·35 day	—	·118 day (1).
126·94 day	—	·126 day (2).

Between (1) and (2) we proceed to interpolate, again by proportional parts, the anomalies corresponding to the following equations: — ·119 — ·120 — ·121 — ·122 — ·123 — ·124, and — ·125 as in Brahma siddhānta, Eye-table **h** for tithis, page 193 infra; the same device is used in regard to moon's anomalies and equations—Special Table III, page 81 and Eye-table **e** to **g**, pages 171 to 192 below

193. The anomalies and equations of the moon for nakshatras, Eye-table, section **f**, are not shown in Special Table III, because they are dealt with in exactly the same manner, only with a different scale of conversion, as stated elsewhere, paragraph 46, page 14. Equations according to the second Ārya siddhānta are also shown in Special Table III in order to bring out the fact that they differ from equations according to the first Ārya siddhānta only in the fourth decimal place, and that, therefore, separate anomaly and equation tables for the second Ārya siddhānta are not necessary.

I.—*Table showing* (1) *how the* 0 *day of the sidereal-anomalistic year indicated in heavy type in columns* 6, 12, 18, *was arrived at for Eye-table, sections* **h** *and* **i**;
(2) *corrections to be applied at different epochs when using Eye-tables* **h** *and* **i**;
(3) *Sodhya in degrees at different epochs under Brahma siddhānta, Siddhānta Sirōmani and Sūrya siddhānta.*

	Brahma siddhānta.						Siddhānta Śirōmani.						Sūrya siddhānta.					
Year Kali-yuga.	Sun's anomaly at moment of commencement of *mean* solar year.	Śodhya in degrees.	Sun's anomaly at commencement of true solar year.		Day of Indian solar year corresponding to 0 day of anomalistic year.	Correction to be applied when using the Eye-table, sections **h** and **i**.	Sun's anomaly at moment of commencement of *mean* solar year.	Śodhya in degrees.	Sun's anomaly at commencement of true solar year.		Day of Indian solar year corresponding to 0 day of anomalistic year.	Correction to be applied when using the Eye-table, sections **h** and **i**.	Sun's anomaly at moment of commencement of *mean* solar year.	Śodhya in degrees.	Sun's anomaly at commencement of true solar year.		Day of Indian solar year corresponding to 0 day of anomalistic year.	Correction to be applied when using the Eye-table, sections **h** and **i**.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	DEGREES.	DEGREES.	DEGREES.	DAYS.	DAYS.	DAY.	DEGREES.	DEGREES.	DEGREES.	DAYS.	DAYS.	DAY.	DEGREES.	DEGREES.	DEGREES.	DAYS.	DAYS.	DAY.
0	282·2400	2·14069	280·09931	284·1883	81·07	+·16	282·2400	2·14069	280·0993	284·1888	81·07	+·16	282·8704	−2·1377	280·7327	284·8364	80·43	+·10
							282·0950	2·14082	279·9542	284·0408	**81·22**	+·01	282·8542	−2·1378	280·7164	284·8149	80·45	+·10
500							281·9500	2·1425	279·8075	283·8927	81·36	−·13	282·8381	−2·1379	280·7002	284·7984	80·46	+·09
1000	282·2000	2·14095	280·0591	284·1480	81·11	+·12	281·6600	2·1443	279·5157	283·5967	81·66	−·43	282·8058	−2·1381	280·6677	284·7654	80·50	+·05
2000	282·1600	2·14120	280·0188	284·1071	81·14	+·09	281·3700	2·1462	279·2238	283·3000	81·96	−·73	282·7734	−2·1383	280·6351	284·7324	80·53	+·02
3000	282·1200	2·14145	279·9786	284·0663	81·19	+·05	281·3410	2·1463	279·1947	283·2704	81·99	−·76	282·7702	−2·1383	280·6319	284·7291	80·53	+·02
3100	282·1160	2·14148	279·9745	284·0621	81·19	+·04	281·3120	2·1465	279·1655	283·2408	82·02	−·79	282·7670	−2·1383	280·6287	284·7259	80·53	+·02
3200	282·1120	2·14150	279·9705	284·0581	81·19	+·04	281·2830	2·1467	279·1363	283·2102	82·05	−·82	282·7637	−2·1383	280·6254	284·7225	80·54	+·01
3300	282·1080	2·14152	279·9665	284·0540	81·20	+·03	281·2540	2·1469	279·1071	283·1806	82·08	−·85	282·7605	−2·1383	280·6222	284·7193	80·54	+·01
3400	282·1040	2·14155	279·9625	284·0500	81·21	+·02	281·2250	2·1471	279·0779	283·1510	82·11	−·88	282·7573	−2·1384	280·6189	284·7159	80·54	+·01
3500	282·1000	2·14157	279·9584	284·0458	81·21	+·02	281·1960	2·1472	279·0488	283·1214	82·14	−·91	282·7540	−2·1384	280·6156	284·7126	**80·55**	+·00
3600	282·0960	2·14160	279·9544	284·0417	81·22	+·01	281·1670	2·1474	279·0196	283·0918	82·17	−·94	282·7508	−2·1384	280·6124	284·7092	80·55	+·00
3700	282·0920	2·14162	279·9504	284·0377	81·22	+·01	281·1380	2·1476	278·9904	283·0612	82·20	−·97	282·7476	−2·1384	280·6092	284·7060	80·55	−·01
3800	282·0880	2·14165	279·9464	284·0336	81·22	+·01	281·1090	2·1478	278·9612	283·0316	82·23	−1·00	282·7443	−2·1384	280·6059	284·7037	80·56	−·01
3900	282·0840	2·14167	279·9423	284·0295	**81·23**	+·00	281·0800	2·1480	278·9320	283·0020	82·26	−1·03	282·7411	−2·1385	280·6026	284·7303	80·56	−·01
4000	282·0800	2·14170	279·9383	284·0254	81·23	+·00	281·0510	2·1482	278·9028	282·9724	82·29	−1·06	282·7379	−2·1385	280·5994	284·6971	80·56	−·01
4100	282·0760	2·14172	279·9343	284·0213	81·24	−·01	281·0220	2·1483	278·8737	282·9452	82·32	−1·09	282·7346	−2·1385	280·5961	284·6937	80·57	−·02
4200	282·0720	2·14175	279·9303	284·0173	81·24	−·01	280·9934	2·1485	278·8445	282·9156	82·35	−1·12	282·7314	−2·1385	280·5929	284·6905	80·57	−·02
4300	282·0680	2·14177	279·9262	284·0132	81·24	−·01	280·9640	2·1487	278·8153	282·8860	82·38	−1·15	282·7282	−2·1385	280·5897	284·6872	80·57	−·02
4400	282·0640	2·14180	279·9222	284·0092	81·25	−·02	280·9350	2·1489	278·7861	282·8564	82·41	−1·18	282·7249	−2·1386	280·5863	284·6858	80·58	−·03
4500	282·0600	2·14182	279·9182	284·0051	81·25	−·02	280·9060	2·1491	278·7569	282·8262	82·44	−1·21	282·7217	−2·1386	280·5831	284·6805	80·58	−·03
4600	282·0560	2·14185	279·9142	284·0010	81·25	−·02	280·8770	2·1492	278·7277	282·7966	82·47	−1·24	282·7185	−2·1386	280·5799	284·6773	80·58	−·03
4700	282·0520	2·14187	279·9101	283·9969	81·26	−·03	280·8480	2·1494	278·6986	282·7670	82·50	−1·27	282·7152	−2·1386	280·5766	284·6739	80·59	−·04
4800	282·0480	2·14190	279·9061	283·9928	81·26	−·03	280·8190	2·1496	278·6694	282·7374	82·53	−1·30	282·7119	−2·1386	280·5733	284·6706	80·59	−·04
4900	282·0440	2·14193	279·9021	283·9888	81·27	−·04	280·7900	2·1498	278·6402	282·7078	82·56	−1·33	282·7086	−2·1387	280·5699	284·6671	80·59	−·04
5000	282·0400	2·14195	279·8981	283·9847	81·27	−·04												

II.—Sun-table, showing process of converting anomalies and equations in degrees into anomalies and equations in days of the solar year for the purposes of the Eye-table, sections **h** *and* **i**. *For explanation* **a** *of the symbols* **m**, **M**, **a**, **A**, **r**, R, *see paragraphs* 193, 196 *of the Text.*

Stages of the sun's anomaly in degrees according of Prof. Jacobi, *Ep. Ind.*, Vol. I.				Brahma siddhānta and Siddhānta Śiromaṇi.										Sūrya siddhānta.				
				Sun's anomaly in days of the solar year uncorrected for equation. (Brahma siddhānta and Siddhānta Śiromaṇi.)				Sun's equation in degrees.	Equation in decimals of a day.	Sun's anomaly in days of the solar year (Brahma siddhānta and Siddhānta Śiromaṇi), corrected for tithi equation.				Sun's anomaly in days of the solar year, uncorrected for equation.				Sun's equation in degrees.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
M	M	M	M	**m**	**m**	**m**	**m**	+ A or − B	−**a** or +**r**	**m** + **a**	**m** + **a**	**m** − **r**	**m** − **r**	**m**	**m**	**m**	**m**	+ A or − B
Eqn. +	Eqn. +	Eqn. −	Eqn. −	Eqn. −	Equ. −	Eqn. +	Eqn. +		*	Eqn. −	Eqn. −	Eqn. +	Equ. +	Eqn. −	Eqn. −	Eqn. +	Equ +	
DEGREES.	DEGREES.	DEGREES.	DEGREES.	DAYS.	DAYS.	DAYS.	DAYS.	DEGREES.	DAY.	DAYS.	DAYS.	DAYS.	DAYS.	DAYS.	DAYS.	DAYS.	DAYS.	DEGREES.
·00	180·00	180·00	360·00	81·23	263·86	263·86	81·23	·0000	·0000	81·23	263 86	263·86	81 23	80·55	263·18	263·18	80·55	·0000
3·75	176·25	183·75	356·25	85·03	260·06	267·66	77·43	·1422	·0117	85 04	260·07	267 65	77·42	84·34	259·37	266·98	76·74	·1455
7·50	172·50	187·50	352·50	88·84	256·25	271·47	73·62	·2842	·0233	88 86	256·27	271·45	73·60	88·16	255·57	270 79	72 94	·2900
11·25	168·75	191·25	348·75	92·64	252 45	275.27	69·82	·4244	·0348	92·67	252·48	275·24	69 79	91·96	251·76	274·59	69·13	·4327
15·00	165·00	195·00	345·00	96·45	248·64	279·08	66·01	·5630	·0462	96·50	248·69	279·03	65 96	95·77	247·96	278·40	65·32	·5733
18·75	161·25	198·75	341·25	100·25	244·84	282·88	62·21	·6992	·0573	100·31	244·90	282·82	62·15	99·57	244·15	282·20	61·52	·7105
22·50	157·50	202·50	337·50	104 06	241·03	286·69	58·40	·8319	·0682	104·13	241·10	286 62	58·23	103 38	240·35	286·01	57 72	·8444
26·25	153·75	206·25	333·75	107·86	237·23	290·49	54·60	·9617	·0789	107·94	237·31	290·41	54·52	107·18	236 54	289·81	53·91	·9747
30·00	150·00	210·00	330·00	111·67	233·42	294·30	50·79	1·0875	·0892	111·76	233·51	294·21	50·70	110·99	232·74	293 62	50 11	1·1008
33·75	146·25	213·75	326·25	115·47	229·62	298·10	46·99	1·2086	·0991	115·57	229·72	298·00	46·89	114·79	228·93	297·42	46·30	1·2216
37·50	142·50	217·50	322·50	119·28	225·81	301·91	43·18	1·3242	·1086	119·39	225·92	301 80	43 07	118 60	225·13	301·22	42·50	1·3369
41·25	138·75	221·25	318·75	123·08	222·01	305·71	39·38	1·4344	·1177	123·20	222·13	305·59	39·26	122·40	221 32	305·03	38·69	1·4464
45·00	135·00	225·00	315·00	126·89	218·20	309·52	35·57	1·5380	·1262	127 02	218·33	309·49	·35·44	126·21	217·52	308·83	34·89	1·5492
48·75	131·25	228·75	311·25	130 69	214·40	313·32	31 77	1·6358	·1342	130·82	214·53	313·19	31·64	130·01	213·72	312·64	31·08	1·6455
52·50	127·50	232·50	307·50	134 50	210·59	317·13	27·96	1·7261	·1416	134·64	210 73	316·99	27·82	133·82	209·91	316·44	27 28	1·7347
56·25	123·75	236·25	303·75	138·30	206·79	320·93	24 16	1·8089	·1484	138·45	206·94	320·78	24 01	137·62	206 11	320 25	23·47	1·8164
60 00	120·00	240·00	300·00	142·11	202·98	324·74	20 35	1·8842	·1546	142·26	203 13	324·59	20·20	141·43	202·30	324 05	19·67	1·8905
63·75	116·25	243·75	296·25	145·91	199 18	328·54	16·55	1 9514	·1601	146·07	199·34	328 38	16 39	145 23	198·50	327·86	15·87	1·9561
67·50	112·50	247·50	292·50	149·72	195 37	332·35	12·74	2 0103	·1649	149 88	195·53	332·19	12 58	149·03	194·69	331·66	12·06	2·0138
71·25	108·75	251·25	288·75	153·52	191·57	336·15	8·91	2·0603	·1690	153·69	191·74	335·98	8·77	152·84	190·89	335 47	8·26	2·0827
75·00	105·00	255·00	285·00	157·33	187·76	339·96	5·13	2·1011	·1723	157·50	187·93	339·79	4 96	156·64	187·08	339·27	4·45	2·1030
78·75	101·25	258·75	281·25	161 13	183·96	343·76	1·33	2·1386	·1750	161·30	184·13	343 59	1·16	160·45	183·28	343·08	0·65	2·1344
82·50	97·50	262·50	277·50	164·94	180·15	347·57	362·78	2·1569	·1769	165 12	180·33	347·39	362·60	164·25	179·47	346·88	362·10	2·1572
86·25	93·75	266 25	273·75	168·74	176·35	351·37	358 98	2·1708	·1781	168·92	176·53	351·19	358·80	168·06	175 67	350 68	358·30	2·1708
90·00	90·00	270·00	270·00	172·54	172·54	355·17	355·17	2·1753	·1784	172·72	172·72	354 99	354·99	171·86	171·86	354·49	354·49	2·1753

II.—Sun table, showing process of converting anomalies and equations in degrees into anomalies and equations in days of the solar year for the purposes of the Eye-table—cont.

Sūrya siddhānta.										First Ārya siddhānta.									
Sun's equation converted into decimals of a day.		Sun's anomaly in days of the solar year, corrected for tithi equation.				Sun's anomaly in days of the solar year, corrected for yoga equation.				Sun's anomaly in days of the solar year, uncorrected for equation.				Sun's equation for tithis.		Sun's anomaly in days of the solar year, corrected for tithi equations.			
For tithis.	For yogas.													In degrees.	In days.				
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
+r or −a	+r or −a	m + a	m + a	m − r	m − r	m − r	m − r	m + a	m + a	m	m	m	m	+A or −B	−a or +r	m + a	m + a	m − r	m − r
		Eqn.−	Eqn.−	Eqn.+	Eqn.+	Eqn.+	Eqn.+	Eqn.−	Eqn.−	Eqn.−	Eqn.−	Eqn.+	Eqn.+			Eqn.−	Eqn.−	Eqn.+	Eqn.+
DAY.	DAY.	DAYS.	DAYS.	DAYS.	DAYS.	DAYS.	DAYS.	DAYS.	DAYS.	DAYS.	DAYS.	DAYS.	DAYS.	DEGREES.	DAY.	DAYS	DAYS.	DAYS.	DAYS.
·0000	·0000	80·55	263·18	263·18	80·55	80·55	263 18	263·18	80·55	81·29	263·92	263·92	81·29	·0000	·0000	81·29	263 92	263 92	81·29
·0119	·0103	84·36	259·38	266·97	76·73	84·34	259 36	266·89	76·75	85·09	260·12	267·72	77·49	·1405	·0115	85·10	260·13	267 71	77·48
·0238	·0205	88 18	255·59	270·77	72·92	88·14	255·55	270·81	72·96	88·90	256·31	271·53	73·68	·2805	·0230	88·92	256·33	271 51	73·66
·0355	·0306	92·00	251·80	274·55	69·03	91·93	251·73	274·72	69·16	92·70	252 51	275·33	69·88	·4189	·0844	92·73	252·54	275·30	69·85
0470	·0105	95 82	248·01	278·35	65·28	95·73	247 92	278·44	65·37	96 51	248 70	279·14	66·07	·5561	·0456	96·56	248·75	279·09	66·02
·0583	·0502	99·63	244 21	282·14	61·46	99·52	244·10	282·25	71·57	100 31	244·90	282·94	62·27	·6905	·0566	100·37	244 96	282·88	62·21
·0693	·0596	103·45	240 42	285·94	57·65	103·32	240·29	286·07	57·78	104·12	241·09	286·75	58·46	·8219	·0674	104·19	241·16	286·68	58·39
·0799	·0688	107·26	236·62	289·73	53 83	107·11	236·47	289·88	53·98	107·92	237·29	290·55	54·66	·9500	·0779	108·00	237·37	290·47	54·58
·0903	·0777	111·08	232 83	293·53	50·02	110·91	232 66	293·70	50·19	111·73	233 48	294·36	50 85	1·0744	·0881	111·82	233·57	294·27	50·76
·1002	·0863	114·89	229 03	297·32	46·20	114·70	228·84	297·51	46 39	115·53	229·68	298·16	47·05	1·1936	·0979	115·63	229·78	298·06	46 95
·1097	·0944	118 71	225·24	301·11	42 39	118·51	225·04	301·31	42·59	119·34	225·87	301·97	43·24	1·3080	·1073	119·45	225·98	301·86	43·13
·1186	·1021	122 52	221·44	304·91	38·57	122·30	221·22	305·13	38 79	123·14	222·07	305·77	39·44	1·4169	·1162	123·26	222·19	305·65	39 32
·1271	·1094	126 34	217 65	308·70	34·76	126 10	217·41	308 94	35·00	126 95	218·26	309·58	35·63	1·5194	·1246	127·07	218·38	309·46	35·51
·1350	1162	130·14	213·85	312·51	30·95	129·89	213 60	312·76	31 20	130·75	214·46	313·38	31·83	1·6155	·1325	130·88	214·59	313·25	31·70
·1428	·1225	133·96	210·05	316·30	27·14	133·70	209·79	316·56	27·40	134·56	210·65	317·19	28·02	1·7050	·1399	134·70	210·79	317·05	27·88
·1490	·1283	137·77	206·26	320 10	23 32	137·49	205·98	320·38	23·60	138·36	206·85	320·99	24·22	1·7869	·1466	138·51	207·00	320·84	24·07
·1551	·1335	141·59	202·46	323 89	19·51	141·30	202·17	324·18	19·80	142·17	203·04	324·80	20·41	1·8611	·1527	142·32	203·19	324·65	20·26
·1605	·1381	145·39	198·66	327·70	15·71	145·09	198·36	328·00	16·01	145·97	199·24	328·60	16·61	1·9275	·1581	146·13	199·40	328·44	16·45
·1652	1422	149 20	194·86	331·49	11·89	148·89	194·55	331·80	12·20	149·78	195 43	332 41	12·80	1·9855	·1629	149·94	195·59	332·25	12·64
·1692	·1457	153 01	191·06	335·30	8·09	152 69	190·74	335·62	8·41	153·58	191 63	336·21	9·00	2·0350	·1669	153 75	191·80	336·04	8·83
·1725	·1485	156·81	187·25	339·10	4·28	156·49	186·93	339·42	4·60	157·39	187·82	340·02	5·19	2·0755	·1702	157·56	187·99	339·85	5 02
·1751	·1507	160 63	183 46	342·90	0·47	160·30	183·13	343·23	0·80	161·19	184·02	343·82	1·39	2·1075	·1729	161·36	184 19	343·65	1·22
·1769	·1523	164·43	179·65	346 70	361 92	164·10	179·32	347·03	382·25	165·00	180 21	347·63	362·84	2·1305	·1748	165·17	180·38	347·46	362·67
·1781	·1533	168·24	175·85	350·51	358·12	167·91	175·52	350·84	358·45	168·80	176·41	351·43	359·04	2·1444	·1759	168·98	176·59	351·25	358·86
	·1536	172·04	172 04	354 31	354·31	171·71	171·71	354·64	354·64	172·60	172·60	355 23	355 23	2·1489	·1763	172·78	172·78	355·05	355·05

III.—Moon-table showing method of converting anomalies and equations in degrees into anomalies and equations in days and fractions of a day for the purposes of the Eye-table, sections **e** *to* **g**. *For explanation of the symbols* **m**, *M*, **a**, *A*, **r**, *R, see paragraphs* 193, 196 *of the text.*

Stages of the anomaly in degrees according to Prof. Jacobi, *Ep. Ind.*, Vol. I.				Sūrya siddhānta tithis.										Sūrya siddhānta yogas.					Equations according to Brahma siddhānta and Siddhānta Śiromaṇi.		Equations according to first Ārya siddhānta.		Equations according to second Ārya siddhānta.	
				Moon's anomaly in days uncorrected for equation.				Equation in degrees.	Equation as a fraction of a day.	Moon's anomaly in days corrected for tithi equation.				Equations in decimals of a day.	Moon's anomaly in days corrected for yoga equation.				For Tithis.		For Tithis.		For Tithis.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
M	M	M	M	**m**	**m**	**m**	**m**	A or R	**a** or **r**	**m** + **a**	**m** + **a**	**m** − **r**	**m** − **r**	− **a** or + **r**	**m** + **a**	**m** + **a**	**m** − **r**	**m** − **r**	+ A or − R	− **a** or + **r**	+ A or − R	− **a** or + **r**	+ A or − R	− **a** or + **r**
Eqn.+ Degrees.	Eqn.+ Degrees.	Eqn.− Degrees.	Eqn.− Degrees.	Eqn.− Days.	Eqn.− Days.	Eqn.+ Days.	Eqn.+ Days.	Degrees.	Day.	Eqn.− Days.	Eqn.− Days.	Eqn.+ Days.	Eqn.+ Days.	Day.	Eqn.− Days.	Eqn.− Days.	Eqn.+ Days.	Eqn.+ Days.	Degrees.	Day.	Degrees.	Day.	Degrees.	Day.
·00	180·00	180·00	360·00	·000	13·777	13·777	27·555	·0000	·0000	·000	13·777	13·777	27·555	·0000	·000	13·778	13·778	27·555	·0000	·00000	·0000	·00000	·0000	·00000
3·75	176·25	183·75	356·25	·287	13·490	14·064	27·267	·3305	·0271	·314	13·517	14·040	27·240	·0233	·310	13·513	14·044	27·244	·3292	·02700	·3280	·02691	·3289	·02698
7·50	172·50	187·50	352·50	·574	13·203	14·351	26·980	·6644	·0545	·628	13·267	14·297	26·926	·0469	·621	13·250	14·304	26·933	·6569	·05388	·6547	·05370	·6564	·05384
11·25	168·75	191·25	348·75	·861	12·916	14·638	26·693	·99 8	·0813	·942	12·997	14·557	26·612	·0700	·931	12·986	14·568	26·623	·9814	·08050	·9786	·08027	·9805	·08043
15·00	165·00	195·00	345·00	1·148	12·629	14·925	26·406	1·3150	·1077	1·256	12·737	14·817	26·298	·0927	1·241	12·722	14·832	26·313	1·3019	·10679	1·2978	·10646	1·3003	·10666
18·75	161·25	198·75	341·25	1·435	12·342	15·212	26·119	1·6314	·1338	1·569	12·476	15·079	25·986	·1152	1·550	12·457	15·097	26·004	1·6164	·13259	1·6114	·13218	1·6147	·13245
22·50	157·50	202·50	337·50	1·722	12·055	15·499	25·832	1·9403	·1592	1·881	12·218	15·340	25·674	·1370	1·859	12·192	15·360	25·695	1·9239	·15782	1·9175	·15729	1·9219	·15765
26·25	153·75	206·25	333·75	2·009	11·768	15·786	25·545	2·2414	·1839	2·193	11·952	15·602	25·361	·1583	2·167	11·926	15·628	25·387	2·2236	·18240	2·2167	·18183	2·2214	·18222
30·00	150·00	210·00	330·00	2·296	11·481	16·073	25·258	2·5333	·2078	2·504	11·689	15·867	25·050	·1789	2·475	11·660	15·894	25·079	2·5147	·20628	2·5069	·20564	2·5122	·20607
33·75	146·25	213·75	326·25	2·583	11·194	16·360	24·971	2·8133	·2308	2·814	11·426	15·129	24·740	·1986	2·782	11·393	16·161	24·772	2·7942	·22921	2·7855	·22849	2·7914	·22898
37·50	142·50	217·50	322·50	2·870	10·907	16·647	24·684	3·0811	·2527	3·123	11·160	16·394	24·431	·2176	3·088	11·124	16·429	24·466	3·0619	·25117	3·0522	·25037	3·0589	·25092
41·25	138·75	221·25	318·75	3·157	10·620	16·934	24·397	3·3855	·2786	3·439	10·894	16·660	24·123	·2355	3·392	10·855	16·699	24·162	3·3164	·27204	3·3061	·27120	3·3130	·27176
45·00	135·00	225·00	315·00	3·444	10·333	17·222	24·110	3·5750	·2932	3·736	10·626	16·928	23·817	·2524	3·696	10·585	16·970	23·858	3·5564	·29173	3·5453	·29082	3·5528	·29143
48·75	131·25	228·75	311·25	3·731	10·046	17·509	23·823	3·8003	·3117	4·044	10·358	17·196	23·511	·2683	3·999	10·314	17·240	23·555	3·7819	·31023	3·7697	·30923	3·7778	·30989
52·50	127·50	232·50	307·50	4·018	9·759	17·796	23·536	4·0092	·3289	4·347	10·088	17·466	23·207	·2831	4·301	10·042	17·513	23·247	3·9919	·32746	3·9794	·32643	3·9880	·32713
56·25	123·75	236·25	303·75	4·305	9·472	18·083	23·249	4·2008	·3446	4·660	9·816	17·137	22·904	·2966	4·602	9·769	17·785	22·952	4·1844	·34325	4·1714	·34218	4·1800	·34288
60·00	120·00	240·00	300·00	4·592	9·185	18·370	22·962	4·3750	·3589	4·950	9·542	18·010	22·603	·3089	4·901	9·473	18·060	22·653	4·3594	·35760	4·3453	·35644	4·3550	·35724
63·75	116·25	243·75	296·25	4·879	8·898	18·657	22·675	4·5294	·3715	5·250	9 268	18·285	22·304	·3198	5·199	9·217	18·337	22·355	4·5150	·37036	4·5019	·36929	4·5097	·36993
67·50	112·50	247·50	292·50	5·166	8·611	18·944	22·388	4·6655	·3827	5·549	8·993	18·560	22·005	·3294	5·495	8·939	18·019	22·059	4·6517	·38158	4·6369	·38036	4·6469	·38118
71·25	108·75	251·25	288·75	5·453	8·324	19·231	22·101	4·7805	·3921	5·845	8·716	18·839	21·709	·3376	5·791	8·661	18·893	21·763	4·7678	·39170	4·7528	·38987	4·7628	·39069
75·00	105·00	255 00	285·00	5·740	8·037	19·518	21·814	4·8755	·3999	6·140	8·436	19·118	21·414	·3442	6·084	8·381	19·173	21·470	4·8636	·39896	4·8478	·39766	4·8583	·39852
78·75	101·25	258·75	281·25	6·027	7·750	19·805	21·527	4·9497	·4060	6·433	8·155	19·399	21·121	·3495	6·377	8·100	19·455	21·177	4·9361	·40491	4·9228	·40381	4·9358	·40488
82·50	97·50	262·50	277·50	6·314	7·463	20·092	21·240	5·0036	4·104	6·725	7·873	19·682	20·830	·3533	6·668	7·816	19·788	20·887	4·9928	·40956	4·9769	·40825	4·9878	·40915
86·25	93·75	266·25	273·75	6·602	7·176	20·379	20·953	5·0358	·4131	7·014	7·589	19·966	20·539	·3556	6·957	7·531	20·023	20·507	5·0254	·41220	5·0064	·41067	5·0169	·41153
90·00	90·00	270·00	270·00	6·889	6·889	20·666	20·666	5·0461	·4139	7·303	7·303	20·252	20·252	·3563	7·245	7·245	20·310	20·310	5·0853	·41804	5·0192	·41172	5·0294	·41256

SECTION iv.—*Computation of number of days comprised in each solar month.*

199. The days in each solar month are obtained from the number of days in the solar year up to the moment of each sankrānti entered in section **a** of the Eye-table. The manner in which these days are fixed is by no means simple; but it can be understood with some little trouble by reference to special Sun-table I which was explained above. It will be seen from that table that the sun's anomaly at the moment of commencement of the mean solar year K.Y. 4200 was by Sūrya siddhānta 282·7314°, and that the sun's anomaly for the corresponding day in K.Y. 4300 was 282·7282°. The difference is ·0032° for a hundred years or ·0022 for two-thirds of a century. Consequently at the commencement of mean solar year K.Y. 4267, the sun's mean anomaly was 282·73241°. The equation for this anomaly, or śodhya in degrees is, according to special Table I and all the authorities, 2·1385°; but Mr. Dikshit, for some unaccountable reason, as admitted by his joint-author, Mr. Sewell, at page 15 of his *Indian Chronography*, adopted 2·13943644° as the śodhya by Sūrya siddhānta for K.Y. 4238. The figure adopted by Mr. Dikshit will not become true for Sūrya siddhānta till somewhere about 10,000 K.Y. or A.D. 7000. Mr. Dikshit must have had some reason for this extraordinary assumption, but it may be presumed, in the case of such a well-known system as the Sūrya siddhānta, which had been in use for hundreds of years, that there was a general consensus or tradition among Indian astronomers as to the number of days comprised in each solar month, and that Mr. Dikshit adjusted his figures in some way to suit the general tradition. In any case, it would be very unsafe to attempt to recalculate the lengths of the solar months so as to suit the correct śodhya for K.Y. 4238, and to run counter to what must be presumed to be the traditional lengths of the solar months under the Sūrya siddhānta; and the object of the present work is to expound in plain language results acted on by Indian astronomers and calendar-makers during the epigraphical period, not to correct those results on account of any error, real or presumed.

200. It being given, then, that the mean anomaly of the sun at 0 day *mean* solar year in K.Y. 4267 was 282·73241° and that the equation for this anomaly or śodhya in degrees was 2·13944°, therefore, the mean anomaly of the sun at 0 day *true* solar year was 282·73241° — 2·13944° = 280·59297°. From this we have the following successive stages of anomaly and equation, which enable us to calculate the moment of entry of the sun into each sankrānti by Sūrya siddhānta. It will be seen that all the stages of the anomaly and all the equations given below are extracted from Professor Jacobi's tables reproduced in columns 1 to 4 and 19 of special Sun-table II, pages 79 and 80 supra.

Sun's anomaly.	Mean longitude of sun in degrees.	Equation in degrees.	True longitude of sun.
280·59297°	− 2·13944	+ 2·13944°	
307·50000°	+ 24·76759	+ 1·73472 Diff.	26·50231° Diff.
311·25000	+ 28·51759	+ 1·64555 ·08917°	30·16314° 3·66083°
341·25000	+ 58·51759	+ ·71055	59·22814°
345·00000	62·26759	+ ·57333	62·84092
11·25000	88·51759	− ·43278	88·08481
15·00000	92·26759	− ·57333	91·69426
41·25000	118·51759	− 1·44639	117·07120
45·00000	122·26759	− 1·54917	120·71842
71·25000	148·51759	− 2·06278	146·45481
75·00000	152·26759	− 2·10305	150·16454
101·25000	178·51759	− 2·18444	176·33315
105·00000	182·26759	− 2·10305	180·16454
131·25000	208·51759	− 1·64555	206·87204
135·00000	212·26759	− 1·54917	210·71842
161·25000	238·51759	− ·71055	237·80704
165·00000	242·26759	− ·57333	241·69426
191·25000	268·51759	+ ·43278	268·95037
195·00000	272·26759	+ ·57333	272·84092
221·25000	298·51759	+ 1·44639	299·96398
225·00000	302·26759	+ 1·54917	303·81676
247·50000	324·76759	+ 2·01389	326·78148
251·25000	328·51759	+ 2·06278	330·58037

201. Our object being to discover the moment of the Indian solar year when the sun enters each sankrānti, i.e., when his true longitude is 30°, 60°, 90°, etc., up to 360°, we shall first endeavour to find out when exactly he reaches 30° true longitude. We see from the first two lines of the above table that when the sun reaches 26·50231° true longitude his mean longitude is 26·50231° – 1·73472°, and when his true longitude is 30·16314°, his mean longitude is 30·16314° less 1·64555°. As these figures are taken from two successive stages of the sun's anomaly according to column 4 of Sun-table II (page 79 supra), his equation at any point between the two stages is assumed to be in proportion to the difference between the equation of the first and the equation of the second stage. In other words, when the sun reaches 30° true longitude, his mean longitude will be

$$= 30° - \left(1·64555 + ·16314 \times \frac{·08917}{3·66083}\right)$$
$$= 30° - (1·64555 + ·16314 \times ·024358)$$
$$= 30° - (1·64555 + ·00397376412)$$
$$= 30° - 1·64953°$$
$$= 28·35047°$$

This then, viz., 28·35047° is the sun's mean longitude when his true longitude is 30°. In order to know the number of days of the solar year that must have elapsed when the sun reaches 28·35047° mean longitude we must find his distance at this moment from the point when he commences the true Indian solar year. We know that the distance from the latter point to 0° mean longitude is the sodhya in degrees, i.e., 2·13944°. Therefore the sun's mean longitude reckoned from the commencement of the Indian solar year to mean longitude 28·35047° = 28·35047° + 2·13944° = 30·48991.°

(1) Now the sun takes $\frac{365·258756481}{360}$ or 1·014607 days to travel one degree of mean longitude.

∴ For 30·48991° of mean longitude he takes 30·48991° × 1·014607 = 30·93527611537 days. This is the number of days consitituting Mēsha month (Tamil *Chittirai*) according to Sūrya siddhānta.

Dikshit's corresponding figure is 30·93527 days, which is identical with the result reached by the present method.

For the remaining sankrāntis we may omit the explanation which is the same as the above and simply give the working.

(2) When the sun reaches 60° true longitude, his mean longitude is

$$60° - \left(·57333 + 2·84092 \times \frac{·13722}{3·61278}\right)$$
$$= 60° - (·57333 \times 2·84092 \times ·0379868) = 60° - (·57333 + ·1079032)$$
$$= 60° - ·68124° = 59·31876.$$

Now (59·331876° + 2·13944°) × 1·014607 = 62·35594021954 days

Dikshit's result = 62·3555 days

Difference ·0004 day

(3) When the sun reaches 90° true longitude, his mean longitude is

$$90° + \left(·57333 - 1·69426 \times \frac{·14055}{3·60945}\right) = 90° - (·57333 - 1·69426 \times ·038925)$$
$$= 90° + (·57333 - ·06595) = 90° + ·50738° = 90·50738°.$$

Now (90°·50738 + 2·13944) × 1·01407 = 94·00011209974 days.

Dikshit's result = 94·00028 days.

Difference ·00017 day.

(4) When the sun reaches 120° true longitude, his mean longitude is

$$120° + \left(1·54917 - 0·71842 \times \frac{·10282}{3·64722}\right) = 120° + (1·54917 - ·71842 \times ·02819°)$$
$$= 120° + (1·54917 - ·02015) = 120° + 1·52892° = 121·52892°.$$

Now (121·52892 + 2·13944) × 1·01461 = 125·475154 days.

Dikshit's result = 125·4755 days.

Difference ·0004 day.

(5) When the sun reaches 150° true longitude, his mean longitude is

$$150° + \left(2·10305 - ·16454 \times \frac{·04027}{·26955}\right) = 150° + (2·10305 - ·16454 \times ·010855)$$
$$= 150° + (2·10305 - ·001786) = 150° + 2·10127 = 152·10127°.$$

Now (152·10127 + 2·13944) × 1·01461 = 156·494167 days.

Dikshit's result = 156·49417 days.

(6) When the sun reaches 180° true longitude, his mean longitude is
$180° + \left(2{\cdot}10305° + {\cdot}16454 \times \frac{{\cdot}03139}{3{\cdot}78139}\right) = 180° + (2{\cdot}10305° + {\cdot}16454 \times {\cdot}0083°)$.
$= 180° + (2{\cdot}10305° + {\cdot}001366°) = 182{\cdot}10442°$.
Now $(182{\cdot}10442 + 2{\cdot}13944) \times 1{\cdot}01461 = 186{\cdot}935663$ days.
Dikshit's result = 186·93555 days.

(7) When the sun's true longitude is 210°, his mean longitude is
$210° + \left(1{\cdot}54917 + {\cdot}71842 \times \frac{{\cdot}0963}{3{\cdot}84636}\right) = 210° + (1{\cdot}54917° + 71842 \times {\cdot}09638 \times {\cdot}26)$
$= 210° + 1{\cdot}54917° + {\cdot}06924 \times {\cdot}26° = 210° + 1{\cdot}54917° + 018024°$
$= 211{\cdot}56719°$.
Now $(211{\cdot}56719 + 2{\cdot}13944) \times 1{\cdot}01461$ days = 216·8288838643 days.
Dikshit's result = 216·82888 days.

(8) When the sun's true longitude is 240°, his mean longitude is
$240° + \left({\cdot}57333 + 1{\cdot}69426 + 13722 \times \frac{1}{3{\cdot}88722}\right)$
$= 240° + {\cdot}57333 + 1{\cdot}69426 + {\cdot}035295 = 240° + {\cdot}57333° + {\cdot}05980°$
$= 240{\cdot}63313°$.
Now $(240{\cdot}63313 + 2{\cdot}13944) \times 1{\cdot}01461$ days = 246·319477 days.
Dikshit's result = 246·31916 days.

(9) When the sun's true longitude is 270°, his mean longitude is
$270° - \left({\cdot}57333 - 2{\cdot}84092 \times \frac{{\cdot}14055}{3{\cdot}84055}\right) = 270° - ({\cdot}57333 - 2{\cdot}84092 \times {\cdot}03613)$
$= 270° - ({\cdot}57333 - {\cdot}10263)° = 270° - {\cdot}47070° = 269{\cdot}5293°$.
Now $(269{\cdot}52930 + 2{\cdot}13944) \times 1{\cdot}014607$ days = 275·637005 days.
Dikshit's result = 275·63694 days.

(10) When the sun's true longitude is 300°, his mean longitude is
$300° - \left(1{\cdot}54917° - 3{\cdot}381676 \times \frac{{\cdot}10282}{3{\cdot}85278}\right)$
$= 300° - (1{\cdot}54917° - 3{\cdot}81676 \times {\cdot}02668) = 300° - (1{\cdot}54917° - {\cdot}101831°)$
$298{\cdot}55266°$.
Now $(298{\cdot}55266 + 2{\cdot}13944) \times 1{\cdot}014607$ days = 305·084309 days.
Dikshit's result = 305·08499 days.

(11) When the sun's true longitude is 330°, his mean longitude is
$330° - \left(2{\cdot}06278° - {\cdot}58037 \times \frac{{\cdot}04889}{3{\cdot}79889}\right)$
$= 330° - (2{\cdot}06278 - {\cdot}58037 \times {\cdot}01287)$
$= 330° - (2{\cdot}06278° - {\cdot}00747) = 330° - 2{\cdot}05531 = 327{\cdot}94469°$.
Now $(327{\cdot}94469 + 2{\cdot}13944) \times 1{\cdot}014607$ days = 334·90566888 days.
Dikshit's result = 334·90555 days.

(12) We know that when the sun's true longitude is 360°, he has completed 365·258756 days of the Indian solar year.

202. *Duration of solar months by Siddhānta Śiromaṇi and Brahma siddhānta.*— The above calculations for Sūrya siddhānta will have shown that the method there followed is correct for the purpose of ascertaining the duration of solar months by Sūrya siddhānta for the epoch K.Y. 4267. So far as the writer is aware, there is no recognized list showing the duration of solar months by the Siddhānta Śiromaṇi either in Mr. Dikshit's *History of Indian Astronomy* or anywhere else. The writer, therefore, used for the Siddhānta Śiromaṇi the method already tried by him successfully for the Sūrya siddhānta, taking of course the equations from column 9 of special Sun-table II (page 79 supra) and fixing the duration of solar months by Siddhānta Śiromaṇi for the epoch K.Y. 4280 which was selected by the writer ; and he arrived at the following results, with which may be compared the results recently published by Mr. Sewell in *Epigraphia Indica* for the epoch K.Y. 4500. It will be seen that the results approximate as closely as may be expected with investigations carried on by two different writers working independently on a subject of acknowledged difficulty and not altogether free from doubt.

Siddhānta Śirōmaṇi.

Day of Indian solar year when sun enters. (1)	By the author's method. (2)	By Mr. R. Sewell's method. (3)	Mr. Sewell's variations for K.Y. 4200. (4)	Actual variation of column 2 as compared with column 3. (5)
	DAYS.	DAYS.	FRACTION OF DAY.	FRACTION OF DAY.
Mēsha sankrānti	0·000	0·000	...	..
Rishabha sankrānti	30·9109	30·9106	+ ·00039	+ ·0003
Mithuna sankrānti	62·3111	62·3092	+ ·0019	+ ·0019
Karkataka sankrānti	93·9312	93·92984	+ ·0017	+ ·0014
Simha sankrānti	125 4213	125·42065	+ ·00027	+ ·0006
Kanya sankrānti	156·4805	156·48109	− ·00072	− ·0006
Tula sankrānti	186·9562	186 95819	− ·0014	− ·0020
Vrischika sankrānti	216·8699	216·87306	−· 0034	− ·0032
Dhanus sankrānti	246·3774	246·38164	− ·0029	− ·0042
Makara sankrānti	275·7160	275·7201	− ·0033	− ·0041
Kumbha sankrānti	305·1533	305·15744	− ·00105	− ·0041
Mīna sankrānti	334·9385	334·9424	− ·00014	−· 0039

N.B.—The same method was used to determine the lengths of the solar months according to *Brahma siddhānta* which are entered in section **a** of the Brahma siddhānta Eye-table.

SECTION V.—*Construction of Sunrise table III.*

203. The moment of *sunrise* for any latitude and longitude in India can be ascertained by means of Table III based on the rules and table of *asus* given by Professor Jacobi in Volume I of the *Epigraphia Indica*. Professor Jacobi has himself given detailed tables for sunrise in Volume II of the same publication, but the results achieved by means of those tables can, it is believed, be more easily reached by the present Table III. For the purpose of determining the equation of time for each day of the solar year, the sun's equation of the centre, according to Eye-table **h** was used, with the sign changed: likewise the *asus* given in Professor Jacobi's table and reproduced in paragraph 125, page 44 supra, had to be suitably modified.

Thus (according to Professor Jacobi's table) in the 10th degree of northern latitude 30 degrees of sign 1 of the zodiac take 1544 *asus* or 1544 × 4 seconds of time to rise; or in lunation-longitude,

$\left(\frac{30}{360}\right) \times 29{\cdot}53059$, or 2·46088 units of space take 1544 × 4 seconds of time to rise;

$$\therefore \text{1 unit of space takes } \frac{1544 \times 4}{2{\cdot}46088} = 1544 \times 1{\cdot}62 = 2{,}510 \text{ seconds.}$$

This 2,510 then, is the factor by which each day's equation of the centre according to Eye-table **h** should be multiplied (so long as the sun is in the first sign) in order to give that day's equation of time.

And generally, all the *asus* in Professor Jacobi's table were multiplied by $\frac{4}{2{\cdot}46088} = 1{\cdot}62$, and the factors thus obtained were multiplied again by each day's equation according to Eye-table **h** in the present work: the result was each day's equation of time in seconds as entered in Table III of this work. The same result could of course have been arrived at directly from Table IVC "Sun's equation in degrees for each day of solar year."

204. In the present Table III, the moment of sunrise for any day of any solar year is obtained by simply adding a figure in the column "Tropical longitude" to the figure opposite the given day of the solar year in the column "Equation of time"; and the result is the correction, in seconds of time, to be applied to mean sunrise at Lanka (6 a.m.) to determine the local sunrise for the given latitude.

SECTION VI.—*Determination of test tithi by different siddhāntas.*

Example.—Āshāḍha śukla 12, Kaliyuga 3585 (expired), A.D. 484.

205. A single test problem, the same as that worked out by Mr. Dikshit in the Introduction to DR. FLEET'S *Gupta Inscriptions* as well as by Professor Jacobi in

Volume I of *Epigraphia Indica*, will suffice to demonstrate the absolute reliability and extreme simplicity of the above processes as carried out in the present work. The problem is to determine the ending moment of *Āshāḍha śukla dvādasī* in *Kaliyuga* 3585 (expired), A.D. 484. The ending moment has to be determined (*a*) for Laṅkā and (*b*) for the latitude and longitude of Eran (Lat. 24°. Long. 78° 15′). Lastly, the problem has to be worked out, first according to the *Sūrya siddhānta*, and then according to the *first Ārya siddhānta*, and then according to Siddhānta Śiromaṇi and Brahma siddhānta.

Sūrya siddhānta.

References to tables.	Days of solar year.	Moon's mean anomaly in days.
(Table II) : Kaliyuga 3585, A.D. 484, * March 18·2212.		
First new moon in solar year	24·3900	4·494
Eye-table **y** : Āshāḍha śukla 12	70·8734	15·764
	95·2634	20·258
Eye-table **h** : ☉'s Eqn. for 95·26 days of solar year = ...	− ·0454	(☉'s Eqn.)—·0454
Eye-table **e** : ☾'s Eqn. for anomaly of 20·212 days = ...	+ ·4138	20·212
	+ ·3684 + ·3684	
* English month, day, and fraction of day marking commencement of solar year	95·6318 * March 18·2212	
	113·8530	

Our result is : the tithi ended at ·8530 of a day, i.e., (by Table VI) at 51 ghaṭikas 11 palas on the 113th day of the English calendar, counting from 1st March.

206. The reader will be pleased to note that this absolutely correct result for the ending moment of a tithi is obtained by *simply adding* up six or seven figures from Table II and the Eye-table and that absolutely no other process is required for any tithi in any year.

Now, by Eye-table section **q**, the 113th day of the English calendar, counting from 1st March, is 21st June;

by Table VI, ·8530 of a day = 51 ghaṭikas 11 palas;
by Eye-table **j** we arrive at the week-day as follows :—

co-efficient of A.D. 400	2
co-efficient of odd year 84 ...	0
co-efficient of June	3
day of the month	21
	26

Since 26, divided by 7, leaves remainder 5 = THURSDAY, the final answer is THURSDAY, 21ST JUNE, A.D. 484, 51 GHAṬIKAS 11 PALAS after mean sunrise at Lanka.

Note.—This is the absolutely correct ending moment, according to Mr. Dikshit; but Professor Jacobi arrives at a result which is 4 palas short. To arrive at the latter result, ☾'s + ☉'s Eqn. must be added to ☉'s Anom. before ascertaining ☉'s Eqn., just as ☉'s Eqn. is in the actual working supra, added to ☾'s anom. before ascertaining ☾'s Eqn. This extra step, however, is a nicety seldom required in practice, since the error on this account can never exceed 6 palas.

207. *To determine the ending moment of the above tithi in true local time at Eran.*—We first of all (v. pp. 40, 41 *supra*) find the sun's sidereal longitude for 95·85 days, for which purpose we deduct the *śodhya*, 2·17 days. Remainder, 94 days nearly.

We turn to Table III and bring down the entry under latitude 24° corresponding to the 94th day of the solar year, for ☉'s trop* long. and the entry corresponding to the 95th day for the equation of time.

* *Note.*—In the solar year, K.Y. 3585 we make no correction for the difference between ☉'s sidereal and tropical longitude because in K.Y. 3600, i.e., only 15 years later, the ☉'s sidera coincided with the ☉'s tropical longitude.

(1) Equation of time (95th day) : + 148 seconds of time.
(2) ⊙'s tropical longitude (94th day) : + 2,647 seconds of time.
(3) To these figures from Table III we add the time difference for the longitude of Eran (+2·53 degrees Ujjain longitude), namely, + 2·53 × 240 or + 608 seconds of time. Total: + 148 + 2647 + 608 = + 3,403 seconds of time.

Now 3,403 seconds of time, divided by 60, are 56 minutes 43 seconds or ·0393 of a day. Adding this to the mean Lanka time already arrived at, viz., ·8529, we obtain, as TRUE LOCAL TIME at ERAN for Āshāḍha śukḷa 12, Kaliyuga 3585, ·8922 of a day or 53 GHATIKAS 32 PALAS which is exactly the same as Mr. Dikshit's result at page 157 of DR. J. F. FLEET'S *Gupta Inscriptions*.

208. *According to first Ārya siddhānta—same tithi calculated by other siddhāntas.*—Mr. Dikshit (*loc. cit.*) worked out the ending moment of the same tithi by the Brahma siddhānta, the Siddhānta Śiromaṇi, and the first Ārya siddhānta. It will be shown, in the illustrative examples appended to the Brahma siddhānta Eye-table that the results for the above tithi according to the present writer's method agree identically with Mr. Dikshit's results for Siddhānta Śiromaṇi as well as for Brahma siddhānta. It remains to test the accuracy of the present method by the first Ārya siddhānta.

	Commencement of Ind. Solar Year.	Sun's anomaly.	Moon's anomaly.	
A.D. 400	March 17·49305	... 23·82154	... 21·4181	Equation.
84 years	·72917	... 0·55681	... 13·4954	
		24·37835	... 24·3783	
			59·2918	
			55·1092	(2 anomalistic
				months).
			4·1826	
Eye-table ȳ Āshāḍha Su. 12		70·8734	... 15·764	
	March 18·2222	... 95·6517	... 19·946	
Sun's Eqn. for 95·62 days			—·0429	
			19·903 ☾ Eqn.	+ ·4111
Sun's Eqn. for 95·62 days + ·41 (☾'s Eqn.)			... ⊙'s Eqn.	— ·0441
				+ ·3670
Sum of ⊙'s + ☾'s Eqn. ...	+·3670	... ...	+·3670	
		March	18·2222	
		March	113·8409	

The tithi ended according to the present method at ·8409 of the day, i.e., at 50 ghaṭikas 27 palas after mean sunrise whereas Mr. Dikshit's result for the same siddhānta is 49 ghaṭikas 48 palas, a difference of 39 palas. This difference, though ordinarily negligible, is somewhat surprising when it is considered that by three other siddhāntas the present writer has reached results identical with Dikshit's and if only for this reason, it requires explanation.

209. The explanation is to be found in Professor Jacobi's statement at page 450 of *Epigraphia Indica*, Vol. I, that the distance of sun from moon is the same in Ārya as in Sūrya siddhānta up to K.Y. 3600. The distance of sun from moon is the same as the mean ending moments of tithis. The reason for this assumption may be conjectured to be this, that the Indian astronomers of the sixth century A.D. were content to rely on the *Sūrya siddhānta* for retrospective mean calculations, there being no object in making them separately by the Ārya siddhānta. If we make this assumption, we have to go back to the figures already worked out by the Sūrya siddhānta and adopt 95·2634 as the interval from the beginning of the solar year to the end of Āshāḍha śu. 12. From this we must deduct the difference between the Ārya and Sūrya siddhānta śodhyas (2·1707 *minus* 2·1468 =) ·0239 day, because the Sūrya siddhānta true solar year begins ·0239 day earlier than

the Ārya siddhānta true solar year and, therefore, the interval from the commencement of the Ārya siddhānta year to the mean ending moment of any tithi must, *ceteris paribus*, be less by ·0239 day.

Then our figures by Ārya siddhānta will be—

Commencement of Ind. solar year A.D. 484	March 18·2222.	
Add, for interval up to Āshāḍha ś 12, 95·2634 days less ·0239 day = ...		95·2395.
Sun's Eqn. by Ārya siddhānta for 95·24 days =	—·0418.	
Moon's Equ. will have to be modified by adopting Sūrya siddhānta figures so far as tithi ending moments are concerned.		
Moon's anomaly for the ending moment of tithi will therefore be—		
21·4181 (Ārya siddhānta, fig. on page 87).—☾'s An. at commencement of the Indian solar year.		
13·4954 (Ārya siddhānta, fig. on page 87).—Eye-table p, addition for 84 years.		
24·3661 (*i.e.*, 24·3900, Sūrya siddhānta, figure on page 86 for interval between commencement of Indian solar year and first new moon in solar year less sodhya difference, ·0239.)		
15·764 (Eye-table y, addition to ☾'s anomaly for Āshāḍha, śukla 12.		
75·043		
55·109 (two anom. months).		
19·934		
— ·0418 (☉'s eqn.)		
19·892 days.		
☾'s Equ. for this anomaly is + ·4110.		
Sum of ☉'s and ☾'s Equs. + ·4110 — ·0418		+ ·3682
	March 113·8299	

The ending moment of the tithi is now ·8299 which is 49 ghatikas 48 palas and is identical with Mr. Dikshit's result (page 157 of Dr. J. F. Fleet's *Gupta Inscriptions*).

SECTION vii.—*Construction of Tables for nakshatras and yogas—Eye-table, sections* **S** *to* **X**.

210. The method of using these tables having been already explained (paragraphs 57 and 58), it remains to state how they were constructed.

The longitude of the moon may, for many purposes in astronomy, be arrived at by the formula (moon's longitude — sun's) + sun's longitude = moon's longitude. "Moon's longitude *minus* the sun's" is the tithi; and at the first new moon in the solar year, as at any other new moon, "moon's longitude — sun's" = 0. Therefore at this moment the sun's longitude is also the moon's longitude, and to determine the nakshatra appropriate to this moment it is only necessary to convert the sun's longitude into days of the solar year. The sun's longitude is reckoned from the 0 point of the mean solar year which is later than the 0 point of the ordinary or true Indian solar year by the śodhya given in special sun Table I in this chapter (page 78). We follow the Sūrya siddhānta for which the śodhya, resting on the authority of Mr. Dikshit (paragraph 199 *supra*) is 2·170694 days (or 2·1334:3644 degrees). The sun's mean longitude in days is, therefore, given by the formula (i—2·170694) where i is the interval in days between the commencement of the Indian solar year and the first new moon in the solar year.

This can be converted into degrees of longitude by multiplying the above formula by ·9856, which is the fraction of a degree accomplished by the sun in a day or $\left(\frac{360^\circ}{365\cdot25878}\right)$.

Now this being also the moon's longitude at the moment of the first new moon in the solar year we have, at the rate of 13° 20′ for each nakshatra, the

following expression for the number of nakshatras and fraction of a nakshatra completed at this moment:—

$$\frac{(i - 2{\cdot}170694) \times {\cdot}9856^\circ}{13{\cdot}33^\circ}.$$

When i is a maximum, i.e., 29·530588 days, the above expression becomes

$$\frac{26{\cdot}966016^\circ}{13{\cdot}33^\circ} = \frac{40^\circ - 13{\cdot}033^\circ}{13{\cdot}33^\circ} = 3 - \frac{13{\cdot}033}{13{\cdot}33};$$

because 3 nakshatras cover 40° of longitude and 26·966016° are equal to 40° — 13·033°. Since a degree of moon's longitude is accomplished in $\frac{27{\cdot}32166}{360}$ or ·0759 of a day, the time required for 13·033° to be accomplished is 13·033 × ·0759 = ·9892 of a day. In other words when i is a maximum, the interval from the first new moon in the solar year to the ending moment of the 3rd nakshatra or *Kṛittikā* is ·9892 of a day. That is why section **s** of the Eye-table (page 156) opens with the entry "3rd nakshatra . . . ·9892 of a day" and the mean ending moment of every successive nakshatra is arrived at by successively adding 1·01191 day, the mean duration of a nakshatra.

211. This is the shortest interval from first new moon in the solar year to the ending moment of nakshatra *Kṛittikā*: for it will be seen that as i in the above expression is diminished the remainder arrived at by deducting (i — 2·170694) × ·9856° from 40° will be increased, in other words the interval from first new moon to end of nakshatra Krittikā will be increased. The figures in section **t** of the Eye-table are arrived at by substituting 1, 2, 3 . . . up to 29 days for i in the expression (i — 2·170694) × ·9856°.

212. Similarly, for yogas the formula is, (moon's — sun's longitude) + 2 × sun's longitude = moon's yoga longitude; and the Yoga-table, section **v** of the Eye-table, is constructed accordingly.

213. It will also be seen that the main difference between the nakshatra and yoga-tables for one siddhānta and those for other siddhāntas arises from the difference of *śodhya*.

CHAPTER V.—PLANETS, PLANETARY AND ECLIPSE CHRONOLOGY.

SECTION i.—*Calculation of planets' mean and geocentric places.*

214. The mean sidereal periods, used in Table IV, are those of modern European astronomy adjusted, as explained below, to the Indian sidereal year. The following table compares the sidereal period of each planet, by Sūrya siddhānta without *bīja*, with that adopted in this work as well as with the results of modern astronomy. A full explanation of the difference between columns 3 and 4 is furnished in paragraphs 217 to 220 below :—

Planet.	Sūrya siddhānta without *bīja*.	Modern astronomy (Encycl. Brit.).	Figure adopted in this work.
Col. 1.	Col. 2.	Col. 3.	Col. 4.
	DAYS.	DAYS.	DAYS.
Mars	686·99749	686·979702	686·98818
Mercury	87·969702	87·969256	87·96939
Jupiter	4332·3206	4332·58479	4332·92495
Venus	224·698568	224·700798	224·70170
Saturn	10765·7730	10759·2010	10761·2795

215. In the first place it was thought unnecessary to observe in regard to planetary sidereal periods the same scrupulous adherence to Indian authorities which is incumbent in the case of the solar year and the synodical month. In the next place, the difference between Indian and modern astronomy in the length of the sidereal year results in a slight displacement of the starting point of Indian celestial longitudes, which displacement amounts to 7′ 4·96″ in 50 years and should be added to the precession,* amounting at the present epoch, according to modern astronomy, to 41′ 52·27″ for fifty years. The total difference between Indian sidereal and modern tropical longitudes is thus 48′ 57·23″ for 50 years or 59″ per annum, while Bhāskara's estimate of the precession, 59·9007″ per annum, is only slightly larger.

216. If the slight annual displacement of the zero point of Indian longitudes, which is a practical postulate of Indian astronomy, however unrecognized in theory, is applied to the sidereal places of planets, their mean sidereal periods will have to be altered as shown in column 4 of paragraph 214 above. In this manner alone will it be possible to apply to the planets the same precession as is applied to the sun, for the purpose of converting sidereal into tropical longitude.

N.B.—By taking this slight liberty with the mean sidereal periods of planets, the exact agreement of the mean place of any planet with its place in modern astronomy is secured, and the serious divergences between the two systems, commented on in Whitney's notes on the *Sūrya siddhānta* have been effectually avoided. As a result, the place, whether mean or actual, assigned to any planet in Table IV, may not tally exactly with Indian calculations, unless the corrections indicated in paragraph 297 below are made; but the difference will generally be found to be very slight, while there is an obvious advantage in having for every possible epoch a mean place for each planet, identical with that assigned to it by modern astronomy.

217. The reader may be desirous of being furnished with a somewhat fuller explanation of the expression "the slight annual displacement of the zero point of Indian longitudes." In the *Encyclopædia Britannica*, 11th edition, Volume 13, page 492, the lengths of the sidereal year in Indian and in modern European astronomy are compared as follows :—

Sūrya siddhānta,	365 d.	6 hrs.	12 min.	36·56″
Modern astronomy	365 d.	6 hrs.	9 min.	9·60″

The difference between the two lengths of the sidereal year is ·00239537 of a day. When the sun has completed a sidereal year according to modern astronomy, he is still assumed in the Sūrya siddhānta to continue to move on for ·00239537 of a day before completing his sidereal orbit ; and during this space of time he describes, by modern astronomy, ·98560901 × ·00239537 = ·002360898 of a degree. In consequence, the 0° point of Indian celestial longitude, which in theory is supposed to be absolutely fixed in the heavens, is actually shifted every

* An investigation of the precessional correction, necessary to convert Indian sidereal into European tropical longitudes will be found in the second paper in the appendix : "Luni-solar precession as applied to Indian astronomy."

year, so far as the sun is concerned, by ·002361 of a degree. For 1,400 years this shift amounts to 3·3054 or a little less than 3⅓ degrees. If, according to the general opinion of historians of Indian astronomy, the sun was at the 0 point of longitude and in *Zēta Piscium* on or about 18 March A.D. 532, his present 0 point in A.D. 1932 is, according to Indian astronomy, 3⅓ degrees to the east of *Zēta Piscium*.

218. The practical consequence of this shift is that a planet which was with the sun in *Zēta Piscium* and in 0° longitude on 18 March A.D. 532, and which during the last 1,400 years has, by modern astronomy, completed a certain *integral* number of revolutions, must in A.D. 1932, i.e., at the end of exactly 1,400 years and exactly at the end of the last of those revolutions, be *ex hypothesi* with the sun again in *Zēta Piscium*; but in Indian astronomy such a planet would still be 3⅓ degrees short of a conjunction with the sun, because the sun's 0 point of longitude had in the interval of 1400 years moved 3⅓ degrees away to the east of *Zēta Piscium*. Now the 0° of longitude must in any system of astronomy be the same for the sun as for the planets, as otherwise we would be in hopeless confusion in investigating their relative positions; and therefore it is inevitable that any conventional lengthening of the sun's course in order to reach his 0 point of longitude should entail a proportionate lengthening of the sidereal course of each planet. We will now proceed to study the exact amounts by which the sidereal periods of the different planets have to be lengthened.

219. *Mars.*—The period of Mars' revolution is 1·88082 sidereal years (modern) and to keep up with the Indian sun, Mars' revolution must be carried forward by 1·88082 × ·002361° = ·00441 degree, before Mars can be said to have returned to 0° longitude. Now Mars' motion (modern astronomy) being 1·9083 days per degree, the lengthening of the sidereal period of revolution in his case is 1·9083 × ·00441 = ·0084748 day.

Add Mars' modern sidereal period:	686·979702 days.
Total sidereal period for Mars, required by Indian astronomy	686·988177 days.

That is, if we fix the sidereal period of Mars at the figure last arrived at, we shall, it is true, not arrive at his true mean sidereal longitude for any given year, particularly for remote years, but the correction to be made in order to get either his true mean sidereal longitude or his true tropical longitude will be the same as in the case of the sun. For the remaining planets, the working is given below without the explanation which is the same as in the case of Mars.

Mercury.—Rate: ·2444 day per degree; ·2408 year for one sidereal revolution (mod. astron.)

·2408 × ·002361 × ·2444 day = ...	·000139 day.
Add Mercury's sidereal period (modern)	87·969256 (mod. astr.).
Total required by Indian astronomy	87·969395 days.

Jupiter.—Rate: 12·035 days per degree; 11·8618 years for 1 sidereal revolution (mod. astron.)

11·8618 × ·002361 × 12·035 day = ...	0·33705 day.
Add Jupiter's sidereal period (modern)	4332·5879.
Total required by Indian astronomy	4332·92495 days.

Venus.—Rate: ·6242 day per degree; ·6151 year for one sidereal revolution.

·6151 × 002361 × ·6242 day = ...	0·0009065 day.
Add Venus' sidereal period (modern)	224·700798 (mod. astr.).
Total required by Indian astronomy	224·701704 days.

Saturn.—Rate: 29·8864 days per degree; 29·46 years for one sidereal revolution.

29·8864 × 29·46 × ·002361 days = ...	2·07855 days.
Add Saturn's sidereal period (modern)	10759·2010 (mod. astr.)
Total required by Indian astronomy	10761·2795 days.

220. It will strike the reader that the result of adopting periods of revolution differing from those recognized in Indian astronomy must be that in a long period of time there would be a considerable divergence between the mean longitude of a planet arrived at with the aid of the *Ephemeris* and that, for instance, implied in an ancient Indian record. To guard against such divergences, it is necessary to tabulate them from epoch to epoch, so that in a given case we may know what to expect in an Indian record. This is a precaution which should certainly not be neglected by an investigator and it will be found from the small table in paragraph 297 *infra* that the necessity for such a correction has been foreseen, and the table is made good use of in the investigation of Rama's horoscope, of which the final result is set out in paragraph 300 below. See also Table IV-B.

221. After settling the sidereal periods of revolution of the several planets, which are necessary to bring Indian astronomy into line with modern results, we have next to settle the exact quantity by which the mean longitude of each planet is increased every year. The best method of ascertaining the annual motion of a planet is to take a long synodic period, the longer the better, that is, a period after which the sun and the planet in question come very nearly together. An example will illustrate what is meant.

222. Mars' period for 193 revolns. = 193 × 686·9882 days. = 132588·7226 days.
363 Indian solar sidereal years = 363 × 365·258756 „ = 132588·9286 days.

363 years = 193 revolns. of Mars + ·2060 day.
Mars' movement in ·2060 day = ·206 × ·524 = ·107944 degree and 193 revolutions = 193 × 360 = 69480 degrees.
∴ In 363 Indian solar years, or 193 Mars' revolutions + ·2060 day, Mars' movement is 69480·107944 degrees.
∴ In one Indian sidereal year Mars' movement = $\frac{69480 \cdot 107944}{363}$ = 191·405253 degrees.

Mercury: 1,474 revolutions of Mercury = 1474 × 87·96939 = 129666·88086 days.
355 Indian sidereal years = 355 × 365·258756 ... ... = 129666·8585 days.

∴ 355 Indian solar years = 1,474 revolutions of Mercury − ·02236 day.
Mercury's movement for ·02236 day = ·02236 × 4·09233° = ·0915045 degree.
Since 355 Indian solar years = 1,474 Mercury's revolutions − ·0915045° = 530639·9084955 degrees of Mercury;
∴ In one Indian sidereal year Mercury's movement = 530639·9084955° ÷ 355 = 1494·76030562°, which (casting out multiples of 360°,) is the same as 54·76030562°.

Jupiter: 131 revolutions of Jupiter = 131 × 4332·92495 days = 567613·175 days.
1554 Indian sidereal years ... ... = 567612·108 days.

∴ 1554 Indian solar years = 131 revolutions of Jupiter − 1·067 days.
Jupiter's movement for 1·067 day = 1·067 × ·083087° = ·088653729 degree.
∴ 1,554 years = (131 × 360°) − ·088653729° = 47159·911346271 degrees of Jupiter;
∴ Jupiter's movement in 1 Indian solar year = the last figure ÷ 1554 = 30·3474333°.

Venus: 1,541 revolutions of Venus = 346265·325864 days (= 1541 × 224·701704).
948 Indian sidereal years ... = 346265·3011 days.
∴ 948 years = 1541, revolutions of Venus − ·0247 day
= (1541 × 360°)−(·0247 × 1·602 degrees) = 554760° − ·0395694° = 554759·960431° of Venus.
∴ Venus' movement in one Indian solar year = the last figure ÷ 948 = 225·189831°.

Saturn: 13 revolutions of Saturn = 13 × 10761·2795 = 139896·6335 days.
383 Indian sidereal years = 383 × 365·258756484 = 139894·103 days.
∴ 383 Indian solar years = 13 revolutions of Saturn − 2·530 days.
= (13 × 360°) − (2·530 × ·03346°) = 4680° − ·0846538° = 4679·915346° of Saturn;
The last figure divided by 383 gives Saturn's yearly movement for one Indian solar year, viz., 12·2191001 degrees.

223. From the yearly motions of the planets, fixed as above, are obtained (1) the daily motions used in calculating the increase of mean longitude of each planet for odd days of the year, see Table IV; (2) the motions of planets for odd years of a century, see Table IV and (3) the cyclic variations for different cycles, prefixed to Table V-A.

224. The planetary anomalies and annual equations, which were used for Table IV of this work, were taken from *Warren's Kāla Sankalita* and are ascribed by that author to a Telugu astronomer of the thirteenth century A.D., called *Vāviḷāḷa Kuchinna*. The tables are no doubt old-fashioned, but they are handy and sufficiently accurate for the purposes of Indian horoscope chronology. This is the main reason for resuscitating them into present-day use. The author is glad to find that so eminent an authority as Professor Jacobi of Bonn and Heidelberg has also adopted the same tables in his contribution to *Epigraphia Indica*, Volume XII. The figures as to longitudes of apses and nodes and the greatest apparent latitudes of planets (Tables IV, IV-G) are taken, partly from Warren and partly from the Siddhānta Śirōmaṇi.

225. The computation of anomalies and equations, even as simplified by Vāviḷāḷa Kuchinna, is a tedious operation for determining planetary places, especially when the number of trials required in an investigation, e.g., for Rama's horoscope (pages 118—120 below) is at all considerable. This inconvenience is altogether eliminated when Tables V-A and V-B are used, and there is hardly any problem in Indian planetary records which cannot be solved by means of those tables. Still, it is occasionally of importance to know what mean longitude corresponds to a given geocentric place of a planet on a particular day of the Indian solar year and *vice versâ*: and in one case at least, viz., that of Mars, as will be explained in paragraph 282 below, this information is indispensable in any investigation concerning that planet. For these reasons an Eye-table has been devised for each planet (vide Table IV), and the reader will do well to familiarize himself with it by studying sec. iv (pages 132—134) of this Chapter.

226. Indian astronomy reckons nine planets, spoken of collectively as *navagrahas*, namely, the Sun, Moon, Mars, Mercury, Jupiter, Venus, Saturn, Rāhu and Kētu. It will be seen that the first seven are named in the order of the days of the week, and this is nearly always the order in which they are referred to in Indian astronomy, showing that planetary week-days and planets' names came into India at the same epoch. Rāhu is another name for the moon's ascending node, one of the points at which the moon's orbit cuts that of the sun (the ecliptic), the other point, or the descending node, being called Kētu. An eclipse cannot happen except when the moon is at either node and the sun is at the same or the opposite node; hence the popular legend which depicts *Rāhu* as a dragon swallowing up the moon or the sun at the time of an eclipse. (See the quotation from Paripāḍal at page 109 below.) All the planets, except Rāhu and Kētu, move, like the sun, from west to east in their apparent path round the earth. Rāhu moves in the opposite direction, and Kētu is always assigned a position 180° from that of Rāhu. For Rāhu see Table IV-K, and for eclipses see Table IV-L, and section v of this Chapter (pages 134 to 150).

227. All the data necessary for calculating the geocentric longitude and latitude of the five planets, Mars, Mercury, Jupiter, Venus and Saturn, are given in Table IV. The actual geocentric places at any time can be deduced from Tables V-A and V-B, as shown by numerous examples in sections ii and iii of this chapter, or from the planetary Eye-tables included in Table IV.

228. The longitude of any planet is its distance, measured in degrees, from an arbitrary point in the ecliptic, which point may perhaps best be defined as the 0 point of the sun's mean longitude. The sun's *mean* longitude is always 0 at a certain part of the Indian solar year, namely, at 2·1707 days from the commencement of each Indian solar (according to the Sūrya siddhānta), while *at the moment of commencement* of the Indian solar year, the sun's *actual* longitude is 0. The difference between the sun's mean and actual longitude at any time is his equation of the centre, and this difference is due to his varying pace at different times of the year as he journeys round the earth. The sun's mean longitude and equation for every complete day of the solar year are given in Table IV-C, and these are most important data in Indian astronomy. Table IV-D gives the increase of the sun's mean longitude for hundredth parts of a day.

229. The sun's mean longitude at any moment is ascertained (in Sūrya siddhānta) by deducting 2·1707 from the number of days and fraction of day elapsed since the commencement of the Indian solar year, and applying to the result the table of sun's longitudes (Table IV-E). The difference between the sun's longitude thus calculated and the mean longitude of the sun for the same moment

given in any European *Nautical Almanac*, is the true Indian precession, and this difference should always be added to the longitude of a planet given in this work for years subsequent to A.D. 532 in order to arrive at the corresponding longitude according to the *Nautical Almanac*. The following table gives the precession to be added to Indian celestial longitudes at various epochs since A.D. 532 (when the European and Indian longitudes coincided*), in order to arrive at the European celestial longitude. The initial rate of precession adopted for this table is ·016322 of a degree per annum or 1·63 degrees for every 100 years. The exact method by which the precessional quantities tabled below have been arrived at will be found fully explained in the paper on precession appended to this work.

(The European longitude of a planet is called its *tropical* longitude from its being regulated by the tropical year, whereas the Indian longitude is generally called a *sidereal* longitude from its being regulated by the sidereal year—see further paragraph 289 below.)

A.D.	Kaliyuga.	Indian precession in degrees.	A.D.	Kaliyuga.	Indian precession in degrees.	A.D.	Kaliyuga.	Indian precession in degrees.
532	3633	0·0	**1062**	4163	8·6	**1600**	4701	17·3
562	3663	0·5	**1100**	4201	9·2	**1632**	4733	17·9
592	3693	1·0	**1132**	4233	9·7	**1662**	4763	18·4
632	3733	1·6	**1162**	4263	10·2	**1700**	4801	19·0
662	3763	2·5	**1200**	4301	11·8	**1732**	4833	19·5
700	3801	3·0	**1232**	4333	11·4	**1762**	4863	20·0
732	3832	3·2	**1262**	4363	11·9	**1800**	4901	20·6
762	3862	3·7	**1300**	4401	12·5	**1832**	4933	21·2
800	3901	4·3	**1332**	4433	13·0	**1862**	4963	21·7
832	3933	4·9	**1362**	4463	13·5	**1900**	5001	22·2
862	3963	5·4	**1400**	4501	14·1	**1932**	5033	22·8
900	4001	6·0	**1432**	4533	14·6	**1962**	5063	23·3
932	4033	6·5	**1462**	4563	15·1	**2000**	5101	23·9
962	4063	7·0	**1500**	4601	16·7	**2032**	5133	24·4
1000	4101	7·6	**1532**	4633	16·3			
1032	4133	8·1	**1562**	4663	16·8			

230. Numerous practical applications of the foregoing observations regarding the difference between European and Indian precession will be found in sections ii and iii of this chapter when we come to compare our verification of Rama's horoscope (page 289 below) and of ancient Chinese observations (paragraph 304) with similar investigations by European astronomers. It will be explained in the same sections that though the names of Indian rāśis are merely translations of Greek names of the signs of the zodiac, yet an Indian astronomer speaking of Jupiter having been in Ṛishabha rāśi about 3100 B.C. does not mean the same thing as a European astronomer who says that Jupiter was in the sign of the zodiac Taurus about the same time. This difference appears to have been overlooked even by competent European astronomers like Bentley when writing about Indian horoscopes. See paragraph 291 below.

231. The reader who has carefully digested all that has been said touching the mean longitudes of planets, their yearly and daily mean motions and the precession, will probably still be puzzled a good deal to understand their actual motions as depicted in Table V-B. He will find that while Jupiter and Saturn occasionally adhere to their mean motions, namely, 12 days per degree in the case of Jupiter and 30 days per degree in the case of Saturn, the other planets do not seem to observe any particular relation between their mean longitudes investigated above and the geocentric longitudes entered in Table V-B, which are longitudes of the planets as seen from the earth and which are also the longitudes recorded in Indian horoscopes. The best plan for the general reader will be to read the text of sections ii and iii of this chapter where he will learn not only how to deal with practical problems but also how to follow the courses of the several planets through the centuries, and he will thus be enabled to form a definite picture of the successive actual movements of each planet which picture is materially different from that presented by the mean longitudes.

232. It is possible to calculate, in the manner explained in the next and subsequent paragraphs, the actual geocentric longitude of any planet at any given moment, just as it is possible to calculate, by the rules already laid down in the earlier portions of this work, the tithi and the nakshatra for any given moment.

* See Paper No. ii in the Appendix: "Luni-solar precession as applied to Indian Astronomy."

The object of this work is, however, to demonstrate that it is equally possible, by taking advantage of cycles of recurrence, to construct a ready-made Ephemeris for any number of years past or future in regard to the positions of planets as well as in regard to tithis and nakshatras. Such an ephemeris or perpetual planetary almanac for the five planets, Mars, Mercury, Jupiter, Venus and Saturn, and embracing a period of 3,000 years, from 1000 B.C. to A.D. 2000, is presented in Tables V-A and V-B, the contents of which are fully explained in sections ii and iii of this chapter.

233. Meanwhile we will explain briefly how the geocentric longitudes of planets may be rigorously computed for any given moment past or future by the rules of Indian astronomy. The method used in modern European astronomy is much more elaborate, as may be seen from any standard work on the subject, for instance. Dr. P. V. NEUGEBAUER'S *Tafeln für Sonne, Planeten und Mond* (Leipsig, 1914).

234. The mean longitude of a planet at any moment is obtained by adding together its mean longitude at the commencement of the century, the mean motion for the given odd year, and the mean motion for the given day. Thus for 202·54 days of the Indian solar year, A.D. 961 (Kaliyuga 4062) we have—

		Degrees.
(Table IV)	Mars' mean longitude at commencement of K.Y. 4001 ...	79·4873
(,,)	Mars' increase of mean longitude for 61 years	155·72
(,,)	,, ,, ,, 202 days	105·85
(,,)	,, ,, ,, ·54 day	·2830
	Answer	341·34°

235. This is the mean longitude of the planet in his path round the sun, though not his longitude, as he appears to us from the earth. To obtain this, which is called the geocentric longitude, and which is the longitude usually cited in Indian time-records, we have to perform a fairly tedious sum, which however, we may, if we like, avoid by using Tables V-A and V-B or the planetary Eye-tables in Table IV.

236. The place of the moon, the only remaining planet, can be deduced either from the tithi or from the nakshatra as in paragraph 241 below.

The principle applied in paragraph 241 is that—

If we find the sun's longitude at the ending moment of a tithi and add it to the moon's elongation or tithi, we shall obtain the moon's longitude, or which is the same thing, the nakshatra current at the ending moment of tithi.

237. The true geocentric longitudes of the other planets may be calculated in the following manner :—

The planets are divided into two classes: *inferior* (Mercury and Venus) and *superior* (Mars, Jupiter and Saturn). Three quantities, which we may call *a*, *b*, *v*, in the case of the inferior planets, Mercury and Venus, and A, B, N, in the case of the superior planets, Mars, Jupiter and Saturn, have to be determined first of all, before working out the actual geocentric longitude of any planet. Having determined these three quantities, the further procedure is the same, whether the planet is superior or inferior. We give below the calculations (1) for the *inferior* planets, Mercury and Venus and (2) for the *superior* planets, Mars, Jupiter and Saturn for 89 completed days of the solar year A.D. 634 (i.e., half an hour after mean sunrise on 17th June A.D. 634), when there was a partial lunar eclipse in the lunar month of Āshāḍha. The Indian solar year A.D. 634, began, according to Table II, at ·0243 of the day, i.e., half an hour after mean sunrise and the 89th or any other day became complete at the same time of the day, but in the working below this half hour is neglected.

I. *True geocentric longitude of Mercury for* 89 *completed days of the Indian solar year A.D.* 634.

Time and English date, mean sunrise on 17*th June A.D.* 634.

(1)—*a*. Mean longitude of planet *minus* mean longitude of sun.

Mean longitude of Mercury.		Mean longitude of sun. (Table IV-C)		Venus' mean longitude.	
For A.D. 600	305·49°	89 days	85·58° *v*	A.D. 600	57·19°
34 years	61·85°			34 years	96·45°
89 days	4·22°			89 days	142·59°
	371·56°				296·23°
Deduct	360°				
	11·56°				

	Mercury's M.L. minus sun's M.L.	Venus' M.L. minus sun's M.L.
11·56°	371·56°	296·23
	— 85·58° *v*	— 85·58 *v*
	285·98° *a*	210·65 *a*

(2)—*b*. Longitude of planet's apsis *minus* sun's mean longitude.

	Mercury.		Venus.
Longitude of planet's apsis for A.D. 634.*	220·43°		(=79 81° + 360°)
Deduct sun's mean longitude (as above) ...	— 85·58°		439·81
			— 85·58
	134·85°	*b*	354·23° *b*
(3)—*v*. Mean longitude of sun	85·58°	*v*	85·58° *v*
(4) Planet's annual equation for *a* (Table IV) ...	— 17·5°	(4)	— 44·5° (4)
(5) Take half of (4) with reversed sign, and add to *b*	134·85		354·23°
	+ 8·75°	...	+ 22·25°
	143·60	(5)	376·48° (5)
(6) Planet's anomalistic equation for (5) (Table IV).	+ 2·7°	(6)	+ 0·55° (6)
(7) Take half of (6), with reversed sign, and add to (5)	143·60		16·48
	— 1·35°		— 0·27°
	142·25°	(7)	16·21° (7)
(8) Anomalistic equation of (7) (Table IV) ...	+ 2·8°	(8)	+ 0·55° (8)
(9) Take (8), with reversed sign, and add to *a*...	285·98°		210·65°
	— 2·8°		— 0·55°
	283·18°	(9)	210·10° (9)
(10) Annual equation of (9) (Table IV)	— 18·0°	(10)	— 44·5° (10)
(11) Add (8) and (10)	— 15·2°	(11)	— 44·0° (11)
(12) Add *v* and (11)	70·38°	(12)	41·58°(12)

70·38 or $10\frac{1}{2}$ degrees in **Mithuna** is the true **geocentric place of Mercury** for the moment in question, while 41·58° or $11\frac{1}{2}$ degrees in **Rishabha** was the true **geocentric place of Venus.**

N.B.—These geocentric places could have been ascertained, by mere inspection, either from the Eye-tables; or from Tables V-A and V-B, see paragraphs 276 and 322 below.

238. II. To find the *latitude* of Mercury (i.e., his distance above or below the ecliptic for the same moment)—

(13) Mercury's mean longitude	11·56° or 371·56°
minus longitude of Mercury's node (Table IV): ...	—20·74
	350·82° (13)
(14) Take (8) above, with sign reversed, and add to (13):	—2·8°
	348·0° (14)
(15) Sine of (14) according to Table IV-H	630 (15)

(16) Equation corresponding to (9) supra, 283·18° by Table IV-G.
Equation for 281·25° = 3886; while equation for the next stage 285·00 = 3957; difference between the two equations = 71
(Table IV-I) " 1·92° = ·51 × 71 = 36·21
∴ Equation for 283·18° = 3886 *plus* 36 = 3922 ... 3922 (16)

(17) Multiply (15) by 120, as a constant for Mercury, and divide the product by (16)

$$\frac{630 \times 120}{3922} = \frac{8560}{3922} = 2{\cdot}1$$

Now by Table IV-F, 225 is the sine of 3·75°

∴ 2·1 is the sine of $\frac{3{\cdot}75 \times 2{\cdot}1}{225} = {\cdot}031°$

N.B.—The corresponding constants for the other planets are the sines of their greatest apparent latitudes, given at foot of Table IV-G.

The latitude of Mercury is ·031° and inasmuch as (14) is greater than 180°, i.e., below the ecliptic, the latitude ·031° is south.

* The apses and nodes of planets, except the moon, have such slow motions that their places need not be calculated for odd years and days.

Mars, Jupiter and Saturn (superior planets).

239. I. *To find the geocentric longitude of Mars, Jupiter and Saturn (superior planets) for 89 completed days in solar year A.D. 634 (mean sunrise on 17th June A.D. 634, when there was a partial lunar eclipse) see paragraph 268, page 117 below.*

Time and English date. Mean Lankā sunrise on 17th June A.D. 634 (15th Śukla tithi of lunar Āshāḍha).

(1) A. Mean longitude of sun *minus* planet's mean longitude.

		Difference between mean longitudes of sun and Mars.	Difference between mean longitudes of sun and Jupiter.	Difference between mean longitudes of sun and Saturn.
Mean longitude of sun (85·58° by Table IV-C) + 360°	= 445·58°	Jupiter's mean long. 445·58°		Saturn's mean long. 445·58°
Mean longitude of Mars				
For A.D. 600,	257·91°	11·63°		201·98°
„ 34 years,	27·37°	311·81°		55·45°
„ 89 days,	46·64°	7·39°		2·98°
	331·92°	330·83°		260·41°
	—331·92°		—330·83°	—260·41°
	113·66° A		114·75° A	185·17° A

(2) B. Longitude of planet's apsis *minus* mean longitude of planet.

	Mars.	*Jupiter.*	*Saturn.*
Longitude of planet's apsis 130·04° or 490·04°		171·27°	236·62°
		+ 360°	+ 360°
		or 531·27°	or 596·62°
Mean longitude of planet ...	—331·92°	—330·83°	— 260·41°
	158·12° B	200·44° B	336·21° B
(3) N. Mean longitude of planet.	331·92° N	330·83° N	260·41° N
(4) Planet's annual equation for A*	+ 38·5° (4)	+ 11·1° (4)	— 0·6° (4)
(5) Take half of (4) with reversed sign, and add to B ...	158·12°	200·44°	336·21°
	— 19·25°	— 5·55°	+ 0·3°
	138·87° (5)	194·89° (5)	336·51° (5)
(6) Planet's anomalistic equation for (5) [Table IV] ...	+ 7·7° (6)	— 1·4° (6)	— 3·1° (6)
(7) Take half of (6), with reversed sign, and add to (5) ...	138·87°	194·89°	336·51°
	— 3·85°	+ 0·7°	+ 1·65°
	135·02° (7)	195·59° (7)	338·06° (7)
(8) Anomalistic equation of (7)* ...	+ 8·2° (8)	— 1·4° (8)	— 2·9° (8)
(9) Take (8), with reversed sign, and add to A ...	113·66°	114·75°	185·17°
	— 8·2°	+ 1·4°	+ 2·9°
	105·46° (9)	115·15° (9)	188·07° (9)
(10) Annual equation of (9) [Table IV]	+ 37·0° (10)	+ 11·1° (10)	— 1·0° (10)
(11) Add (8) and (10): ...	+ 45·2° (11)	+ 9·7° (11)	— 3·9° (11)
(12) Add N and (11): ...	377·12° (12)	340·53° (12)	256·51° (12)

The true **geocentric longitude** 17° in Mēsha, 10½° in Mina, 17° in Dhanus.

N.B.—These geocentric places could have been ascertained, by mere inspection either from the planetary Eye-tables, or from Tables V-A and V-B. See paragraphs 276 and 322 to 324 below.

240. II. To find the latitude of Mars, i.e., his distance above or below the ecliptic for the same moment—

(13) Mar's true geocentric longitude	17·12°
	or 376·12°
minus longitude of Mar's node for A.D. 900 (Table IV) ...	— 40·07°
	336·05° (13)
(14) Take (10) above for Mars, with sign reversed, and add to (13):	— 37·0°
	299·05° (14)
(15) Sine of (14) according to Table IV-H	2981 (15)
(16) Equation for (9) above, 105·16°, by Table IV-G	3573 (16)
(17) Multiply (15) by 90, as a constant for Mars, and divide by (16)	

$$\frac{90 \times 2981}{3573} = \frac{268290}{3573} = 75{\cdot}1$$

N.B.—The corresponding constants for the other planets are the sines of their greatest apparent latitudes, given at foot of Table IV-G.

Now by Table IV-H the sine 75 belongs to an angle between 0° and 3·75°

225 is the sine of 3·75°

∴ 75 „ 1·25°

∴ The **latitude** of Mars sought is 1·25° which is south since (14) is above 180°

* See Table IV under Mars, Jupiter and Saturn respectively.

241. *To find the longitude and latitude of the moon for the above moment*—

We should first of all find the moon's true longitude which we may calculate either from the tithi direct, which being 15 tithis completed is 180°. Moon's longitude = (moon's *minus* sun's longitude) + sun's longitude = 180° + 85·58° + ·32 (☉'s equation by Table IV-A) = 265·90°.

Now to find the moon's latitude at the moment sought—

(1) Find the place of moon's node, i.e., Rāhu—

By Table IV-K place of Rāhu for A.D. 600 is	... ...	196·57
By same table Rāhu's motion for 34 years,	298·18°	or 556·75
N.B.—Rāhu's mean motion for odd years and days should be subtracted from the mean place for century.	89 days 4·77	
34 years and 89 days = 302·95		— 302·95
		253·80° (1)
(2) Moon's true place *minus* place of her node	... ...	265·90°
		— 253·80
		12·10 (2)
(3) Sine of (2) by Table IV-H	... ...	719 (3)

(4) Multiply (3) by $\frac{270}{3438}$, as a constant for the moon: $\frac{719 \times 2{\cdot}70}{3438} = 5{\cdot}6$.

By Table IV-H, 225 is the sine of 3·75°

∴ 56 „ ·94°

Inasmuch as (2) is less than 180°, the **latitude** sought is 0·94° north.

242. The reader should note—

(*a*) that for Venus the procedure is the same as for Mercury;

(*b*) that for Jupiter and Saturn, the procedure is the same as for Mars;

(*c*) that for Mercury and Venus, the geocentric longitude has for its basis the sun's mean longitude and not that of the planet; whereas the geocentric places of Mars, Jupiter and Saturn are based on their respective mean longitudes;

(*d*) that we may always subtract a larger number of degrees from a smaller by adding 360° to the smaller number;

(*e*) that the apsis of any planet except the moon does not change materially in position during a century, and that therefore we need not calculate the change of apsis for odd years or odd days;

(*f*) that after calculating *a*, *b* and *v*, or A, B and N, respectively, the procedure is the same for all planets, whether inferior or superior;

(*g*) that the mean longitudes of planets for decimals of a day may be obtained from the longitude for odd days by prefixing decimals to the latter. Only we should remember that a mean revolution of Mercury is completed in 87 days and a mean revolution of Venus in 225 days, and the increase of Mercury's longitude for ·89 day is not 0·422°, but 3·6422°. Similarly, the increase of Venus' longitude for ·231 day is not ·01009, but ·37009°;

(*h*) that the latitudes of planets are not referred to in Indian usage except in what is known as a planetary fight in astrology;

(*i*) that the greatest apparent latitudes of the several planets and their corresponding Hindu sines are given at foot of Table IV-G.

SECTION II.—*Examination of planetary time-records called horoscopes.*

243. Side by side with calendar dates expressed in vara, tithi and nakshatra, there are to be found, scattered here and there in Indian literature, records of time, indicating the positions of one or more of the chief planets on particular days, whereby the modern investigator is enabled, even when no year, month, or date is expressed, to compute the probable time at which the records were composed, or to which they refer. But to assess at their real value these planetary records,

usually called horoscopes, one or two preliminary observations are necessary in the light of facts disclosed by modern historical research. In the first place, although the Indian horoscope as well as the Indian panchanga is at present used largely, and used chiefly, for astrological purposes, this was not the case always. It is certain that the sun's and moon's motions have been observed in this country from very ancient, in fact from vedic, times for the legitimate purpose of measuring time, and there is little doubt that, like the Babylonians, the Hindus also looked upon planetary records or horoscopes originally in the same light. Even now the horoscope is essentially a record of time from which the astrologer deduces what appears to him to be the influence of the several planets at the moment envisaged by the horoscope.

244. Secondly, as between the Indian calendar and the Indian horoscope, the latter is comparatively a new-comer. Traces of astrological prediction in the Indian literature of the centuries B.C. are few and far between, and they seem to point specially to prediction by means of the sun's and moon's movements rather than by means of the motions of the planets properly so called. When exactly the people of this country became acquainted with the names of the other planets (for the sun and moon are also planets in the Indian system) or began to observe their motions, is a moot point. On the one hand it seems *a priori* probable, from the intercourse of this country with the western nations from very ancient times, that Greek, if not Phœnician, Chaldean and Egyptian astronomy and astrology must have found their way into this country at a very early time. It seems difficult to suppose that Chaldean astrology in particular, which was practised in the Grecian and Roman States for some centuries before A.D. 1, did not find its way into India in the wake of Alexander's conquest or of the Græco-Bactrian civilization. Indeed in an account of the life of Apollonius of Tyana, who lived in the first century A.D., it is stated that he became acquainted with the names of the planets and of the week-days from an Indian prince whom he visited, but there is reason to believe that the extant semi-mythic accounts of the life of Apollonius of Tyana were composed considerably later than the first century A.D.

245. All the historical, as distinguished from the presumptive, evidence that has come down to us points to the probability of western influence on Indian planetary astronomy not having been anterior to the fourth or fifth century A.D., when the works of the great Greek astronomer and astrologer Klaudios Ptolemy and his successors, Paulus Alexandrinus and Firmicus Maternus, were first introduced into this country during the Gupta period. Some mention is made of planet names in the *purāṇas*, but the date of composition of the *purāṇas* is itself a matter of critical speculation. On the whole it may be safe to presume that the Hindus in some way became acquainted with the names of the planets, and possibly of the planetary week-days, a century or two before the Christian era, but that they did not make any practical use of this knowledge until they were brought face to face with its results in Ptolemy's works in the fourth or fifth century A.D. It seems also exceedingly probable that the practice of calculating horoscopes or the positions of the planets at given moments, came into vogue in India a century or two after the fifth A.D. Whether any particular part of the country, e.g., Southern India, acquired a knowledge of planetary astrology from independent Chaldean sources before the introduction of Ptolemy's works into Northern India is also a matter purely for conjecture. We have it on the authority of Juvenal, the Latin satirist of the time of Domitian (first century A.D.), that in his time the wealthy Roman ladies used to employ four classes of sooth-sayers, the Phrygian, the Chaldean, the Etruscan and the Indian. From the way in which Juvenal has coupled Indians with Phrygian augurs in this passage (Satire VI, lines 585—587) it may be presumed that Indian fortune tellers were imported into Rome for their knowledge of augury and not for their knowledge of astronomy, for which Juvenal seems rather to give credit (in this respect again the passage is not free from doubt) to the Chaldean, not to the Indian, sooth-sayer. In confirmation of Juvenal's statement, we have allusions to an Indian science of birds (in the sense of augury) occurring in literature which is entirely destitute of notions of planetary astrology, e.g., the Tamil *Tolkāppiam* The passage where Juvenal refers to Indian augury or Indian astrology has

been the subject of numerous *variæ lectiones* (various readings) and one version refers to female, not male, fortune tellers (*Indæ*= Indian women).

Divitibus responsa dabunt Phryx augur et Indus
Conductus, dubit astrorum mundique peritus,
Aut aliquis senior qui publica fulgura condit.

Translation.

To the rich women answers will be given by a Phrygian augur or by an Indian engaged for hire, or by one who understands the universe and the stars, or by an elderly person who covers up with due rites the parts of the city which have been struck by lightning.

Note.—(1) For *dabunt* some editions read *dabit.*
(2) For *Indus*, the various other readings are *Indæ*, and *inde.*

246. The practical deduction from all these considerations is that one has to be very sure of one's ground before imputing to Indian society before the fifth century A.D. a knowledge or practice of planetary astrology (compare remarks in paragraph 50, page 15 *supra*). Such Indian horoscopes as refer to a previous period must have been composed retrospectively, and this remark applies in a special manner to Rāma's horoscope in the Rāmāyaṇa, which occurs in a canto admitted by critics to be a subsequent composition. Whether Rāma's horoscope was meant to be a real horoscope or merely a description of planets in certain exalted positions has also not yet been settled; but taking it as a horoscope, Bentley ascribed it to the year 961 B.C. while the present writer, had in previous works of his computed the time to correspond to 964 B.C. although he would now not attach any particular significance to the year 964 B.C. as a year of Rāma's birth, or even as a year answering the conditions of Rāma's horoscope (vide paragraph 302 *infra*). The exact manner in which this interesting horoscope can be computed will be shown in section iii of this chapter (pages 112 to 122 *infra*). The references to planet-positions in the Mahābhārata are so conflicting that it is impossible to make any inference from them as to the time referred to; whereas a genuine horoscope containing the positions of the principal planets in rāśis, provided the time of year is indicated even in general terms, should enable an investigator to verify a date in such a manner that the same horoscope would not be applicable to any other date during a period of several thousands of years This is the chronological vantage-ground of the horoscope, and it will be illustrated presently by a thoroughly practical, and at the same time a somewhat unique, example from early Tamil literature; but horoscopes are liable to all the failings to which human compositions are subject, and unless one was certain of all the elements in a horoscope having been correctly recorded, the time inference drawn therefrom may turn out to be widely discrepant from the truth. The obvious inaccuracies in the Mahābhārata references to planets will be commented on in an Appendix. (Paper No. v.)

247. Table V-A showing the increase of the mean longitudes of the principal planets, Mars, Jupiter and Saturn for a period of 2,000 years will be found useful in such investigations. It can be used in various ways, but the most practical way of using it will be illustrated by an example which has itself considerable interest for the student of Tamil literature. The ancient Tamil anthology called *Paripāḍal*, of which an excellent edition in print was brought out in 1918 by the veteran editor of Tamil classics, Mahāmahōpādyāya Paṅdit V. Swāmināṭha Ayyar, and of which the date of composition is as yet a mystery, contains, in the eleventh canto, a description of the river Vaigai (near Madura) in flood. The author of this poem *Nallantuvanār*, commonly believed to be one of the *sangam* poets, to whom we also owe *Kalittogai*, says (see Text, English translation and commentary extracted below, page 109) that he witnessed the flood on a morning when the moon was eclipsed, when the nakshatra Kṛittikā (26·7° to 40° longitude) was at day-break "high up," i.e., at or near the zenith, when Mars was in Mēsha (0° to 29° longitude), Jupiter was in Mīna (330° to 359°), Saturn was in Dhanus and going towards Makara (say 260° to 269°), Venus in Ṛishabha (30° to 59°) and Mercury in Mithuna (60° to 89°).

248. This extract from the poem is a horoscope in the true sense of the word, for it is a time-record, though one drawn up on the occasion of the occurrence of a flood, not of the birth of a human child. It is just the kind of horos-

cope that one would expect from the Babylonian prototype. There are many circumstances which make the investigation of this mysterious time-record as difficult as it is interesting. In the first place, if the poem really is very ancient, the poet may have become acquainted only with the mean positions of the planets, and he may have supplemented his knowledge by observing their actual situation in the heavens Secondly, the above positions are recorded in Tamil verse, whose quaint language cannot be understood even by Tamil readers without a reliable commentary. In this case the commentator, himself an ancient classical author, Parimēlaḻagar, whose commentary on Tiruvaḷḷuvar's Kuṛaḷ is well-known, enjoys the reputation of being thoroughly reliable in literary matters and he may be presumed to be no less so in astronomical matters. Thirdly, neither the lunar month nor the position of the sun is referred to directly in the passage, but from the circumstance that nakshatra Kṛittika, whose sidereal longitude is between 26·7° and 40°, was in or near the zenith at daybreak, the commentator, *Parimēlaḻagar* infers that the sun must have been at or near 90° from this position, i.e., the sun's longitude must have been between 116·7° and 130° since he had not yet risen when the nakshatra was in the zenith. If so, the sun must have been in the first few degrees of Siṁha *rāśi*, and the time must have been within the first few days of the month of *Āvaṇi* or *Siṁha* ; this, in fact, is the commentator's own statement. There is a fourth circumstance which the commentator is careful to note as limiting the position of both sun and moon ; for he remarks that as it was a time of lunar eclipse in Śrāvaṇa month, the moon must have been in nakshatra *Śravishṭhā* or *Dhanishṭhā* (293·3° to 306·7° according to Sūrya and Ārya siddhāntas ; 294° 7′ 5″ to 307° 7′ 40″ according to Brahma siddhānta and Siddhānta Śirōmaṇi, see Eye-table, section **s**) ; and as the *tithi* or distance from the moon to the sun at the middle of a lunar eclipse is exactly 180°, the sun's longitude could not have been less than 113·3° or more than 127° whichever of the four siddhāntas was followed ; and he could not have been more than 7 days old in Siṁha *rāśi* or month. An astronomer may be disposed to object that the hypothesis of the sun being in Siṁha rāśi and the moon in Dhanishṭhā nakshatra hangs on a single peg, namely on Kṛittikā nakshatra being exactly at the zenith, but the ancient Tamil commentator Parimēlaḻagar appears to have entertained no doubt on the point. Fifthly, from the position of Mercury, and more especially from that of Venus recorded *by the poet*, 60° to 89°, and 30° to 59°, respectively, when the sun was, *according to the commentator*, between, say, 120° and 127°, it may be inferred (if the commentator is right) that the poet could not have recorded, or even contemplated, *actual* positions in respect of these planets. The possibility that he referred to *actual* positions in respect of Venus and Mercury as well as of Mars, Jupiter and Saturn, constitutes in fact the crux of the problem ; and we shall examine this alternative later. It will be seen from the anomaly and equation tables of Mercury and Venus (Table IV of the present work) that their maximum distance from the sun is 26° and 48·03°, respectively (i.e., the sum of maximum equations for each planet in Table IV), whereas according to the poet's description, Venus was not less than 60° and Mercury not less than 30° from the sun. Thus, in the case of Venus, it is clear that if the sun was really in Siṁha, the poet could have had in view its *mean* longitude only ; and if so, it becomes pertinent to ask whether he did not contemplate *mean* longitudes in the case of the other planets also. This is our sixth difficulty. [The difference between mean and actual longitudes in the case of Jupiter and Saturn is never very much, but Mars's actual position may be removed by as much as 51·6° from his mean position.]

249. Seventhly, and lastly, the poet may have recorded the positions of the planets either actually as he saw them in the heavens, or partly as he saw them and partly as he imagined them from his knowledge of astronomy. As we have just observed, however, he could not possibly have *seen* Venus in the position he has recorded, if the solar month was Simha or Āvaṇi, as stated by his commentator.

250. Having noted all these seven difficulties, we shall endeavour to solve them, and Table V-A should enable us to do so if there is a solution. To use Table V-A properly, we want two temporary tables which we should make afresh for each problem, and which we shall call respectively "the table for a fixed year" and "the table of moveable years." We note first of all from Table IV the mean

positions of the planets in 1 B.C., i.e., 0 A.D. (which we treat as our fixed year) at a time when the mean longitude of the sun was about 125°, or when about 130 days of the Indian solar year had passed (Table IV-C). This is a good *average* time of the year for the occurrence of a lunar eclipse in Śrāvaṇa.

Table for fixed year 1 B.C. = 0 A.D.

Mean positions of planets at end of 130th day of the Indian solar year, 1 B.C., or 0 A.D.

—	Mars.	Jupiter.	Saturn.
(1) At commencement of Indian solar year in B.C. 1=0 A.D. (Table IV)	254·74°	163·17°	70·54
(2) Planets' motion for 130 days (Table IV)	68·12°	10·80°	4·35°
(3) Total	322·86°	173·97°	74·89°
(4) or in nearest degree	323°	174°	75°
(5) Actual geocentric places recorded by the poet ...	0° to 29°	330° to 359°	270° to 299°
(6) Mean positions corresponding to actual positions recorded by the poet (according to planetary eye-table).	320° to 340°	320° to 348°	274° to 303°
(7) To (4) we have to add in order to arrive at (6) mean positions corresponding to those recorded by the poet ...	−3° to +17°	146° to 184°	195° to 224°
(8) If the year we are in search of is B.C., then we should in order to reach it, add algebraically to (4) ...	−343° to −3°	−180° to −210°	−130° to −160°

251. We now see the use of Table V-A which will enable us to construct our second table, the one for moveable years, in other words to determine approximately, as a first step, the year or years A.D. or B.C. when alone the increases in longitude noted in the last two lines (7) and (8) supra were *possible*. Line (7) of the table will help us in A.D. years and line (8) in B.C. years.

252. Table V-A does not give the increases of longitude of Venus or Mercury from year to year, because their positions are difficult to follow except in the light of the sun's movements and if the others are right, a difference in the position of Venus and Mercury alone may not matter; on the other hand, if in the year that we fix upon, Venus and Mercury happen to be in the positions required by us, so much the better. The actual positions of both Mercury and Venus depend but to a small extent on their mean longitude and principally on the sun's.

253. It is usually therefore, enough, provided we know the month, to set to work with the three major planets, Mars, Jupiter and Saturn, particularly when we are in search of *actual* positions. We may repeat once more that the mean longitude neither of Venus nor of Mercury is a guide, except indirectly, to their actual position which is determined by the sun's position, coupled with the annual and anomalistic equations of Venus or of Mercury as the case may be. We shall find that the search for the positions of three planets is tedious enough when our object is not merely to find when the planets attained certain *mean* positions, but to locate them in their *actual* positions in a year satisfying all our conditions. In the case of Mars in particular we have to bear in mind that the difference between his actual and his mean position varies according to the time of the year. This fact is made evident by Mars's eye-table, which shows us that in order that Mars may be *actually* in Mesha (0° to 29°) on or about the 130th day of the year, his mean position should be between 320° and 340°, and the addition we have to make to the mean position of Mars on the 130th day of our fixed year (1 B.C.) in order to arrive at an actual position in Mêsha rāśi is −3° to + 17° which we have accordingly entered in line (7) of the table in paragraph 250. In the case of Jupiter and Saturn we have taken the precaution to extract their mean positions also from their respective eye-tables, but the difference is not very much in their case.

254. We find from Table V-A that the only years out of 4,000 which can possibly satisfy most of the conditions of our search (i.e., those as to the moon being in Śrāvaṇa and as to the mean longitudes of the three planets, Mars, Jupiter and Saturn) entered in line (6) of the table in paragraph 250 are the following. This will be our table of moveable years from which we should be able to select one to suit our purpose finally. It is therefore of the utmost importance to include in

our table of moveable years in the first instance *all* possible years, so that even if we have to make another table for our fixed year, as we shall have to do in this case, we may not have to change our second table or table of moveable years.

255. *Table of moveable years with reference to 1 B.C. or 0 A.D., as a fixed year; 130th day of Indian solar year. Mean longitude in fixed year 1 B.C.* (*v.* line 4 of the table in paragraph 250).

323° (Mars) 174° (Jupiter) 75° (Saturn)

Limits of increase sought (*v.* lines, 7 and 8 of the table in paragraph 250), in other words, *quantities to be added to the mean longitudes of Mars, Jupiter and Saturn at full moon in Śrāvaṇa, 1 B.C., in order to arrive at the mean longitudes of the same planets at the end of the same tithi in the year sought.*

A.D. Years: − 3° to + 17° (Mars) + 150° to + 180° (Jupiter) 200° to 230° (Saturn).
B.C. Years: − 343° to − 3° (Mars) − 180° to − 210° (Jupiter) − 130° to − 160° (Saturn).

Years.	Day of solar year corresponding to Śrāvaṇa full moon.	Mars. (Table V-A).	Jupiter. (Table V-A).	Saturn. (Table V-A).
A.D. years.				
A.D. 17 (lunar eclipse in Śrāvaṇa—see Table II)	134	14	156	208
A.D. 634 (lunar eclipse in Āshāḍha—Table II)	128	31	161	187
A.D. 694 (lunar eclipse in Āśvina—Table II)	114	355	181	200
A.D. 871 (lunar eclipse in Bhādrapada—Table II, sun's longitude 157°).	135	34	153	203
A.D. 931 (no lunar eclipse)	131	358	173	216
A.D. 1050 (lunar eclipse in Śrāvaṇa—Table II)	134	95	185	230
A.D. 1108 (lunar eclipse in Kārttika—Table II)	123	37	145	219
A.D. 1168 (lunar eclipse in Āśvina—Table II)	129	1	166	232
A.D. 1548 (lunar eclipse in Kārttika—Table II)	115	15	178	195
B.C. years.				
A.D.—160, i.e., 161 B.C. (lunar eclipse in Srāvaṇa—Guinness* Tables). ...	— 25	— 176	— 155	
A.D.—220, i.e., B.C. 221 (no eclipse in Srāvaṇa but there was a lunar eclipse in May 9, Rishabha solar month—Guinness' Tables). ...	— 349	— 196	— 168	
A.D.—397, i.e., B.C. 398 (no eclipse in Srāvaṇa, but there was a lunar eclipse in May 17, which would be the month of solar Mithuna or lunar Jyeshtha—Guinness' Tables). ...	— 28	— 163	— 171	
A.D.—1572, i.e., 1573 B.C. (no lunar eclipse)	— 289	— 186	— 128	

256. The B.C. years will not yield us any date when there was a lunar eclipse in Śrāvana and when the three major planets were in the positions assigned to them by the poet. Although there was a lunar eclipse in Śrāvaṇa of 161 B.C., the mean position of Mars was then such that the planet could not actually have been in Mēsha at full moon in Śravaṇa of that year. The other B.C. years in our table of moveable years are not worth investigating, since there was no lunar eclipse in two of them, while in the third, the eclipse was in Jyeshṭhā, and Mars' mean position (323° — 28°, i.e., 295°) was not such as to give us an actual position for that planet in Mēsha.

257. Incidentally, we may note first that Table V-A is equally useful for a search up to 2000 B.C. or down to A.D. 2000, or for any period of 4,000 years in all. Secondly, in order to use Table V-A, it is not necessary that we should make a start always with mean longitudes of 1 B.C. We may start by calculating mean longitudes for any year B.C. or A.D. and, with that as a fixed year, proceed to determine, by addition or subtraction according to Table V-A, the mean longitudes attained on the corresponding day in any other year which we may call the moveable year. The mean longitudes of the three superior planets for every 10 completed days in the principal years from which, according to the nature of the problem, the choice of a fixed year will have to be made are given at the beginning of Table V-A. These years are 3201, 3102, 2101, 1101, 101, 1 B.C. and A.D. 1000 and 1800. The advantage of making a start with 1 B.C. or 0 A.D. is that each one of the moveable years in our field of selection (the second table) becomes *ipso facto* an A.D. year. This, however, is an advantage which we can easily forgo, provided there is any reason for choosing a fixed year other than 1 B.C. The method of subtraction for B.C. years has obvious inconveniences and it will

* "Tables of Vernal Equinoxes and New Moons for 3,555 years" By H. Grattan Guinness, D.D., F.R.A.S. (London—Hodder and Stoughton, 1896).

generally be better to use the method of addition even for B.C. years, as illustrated in section iii of this chapter, on Rāma's horoscope (paragraph 294, p. 118 below).

258. In A.D. years, if we apply the test of a lunar eclipse in Śrāvaṇa month which, as is the case with eclipses always, ought to be a conclusive test, and *if the ancient commentator is right*, there is only one year which satisfies more or less the Paripāḍal horoscope, although some critics may demur a good deal to accepting it; and that is A.D. 17 in which the actual positions of Mars, Jupiter and Saturn were, as any one may, with a little trouble, satisfy himself by following the instructions in paragraphs 237 and 239 *supra*, or much more quickly by using tables V-A and V-B.

Mars 25·5° in Mēsha.
Jupiter 334° or 4° in Mīna.
Saturn 274·1° or 4° in Makara.

Venus' *mean* longitude at the same date was 28° which was only 2° short of Ṛishabha; it has already been shown (paragraph 248) that Ṛishabha was an impossible rāśi for the actual position of Venus under the given conditions; in A.D. 17 on Śrāvaṇa full moon day she was *actually* in 90·02° (end of Mithuna or beginning of Karkaṭaka). Mercury's mean longitude at Śrāvaṇa full moon of 17 A.D. was not Mithuna, but 252·77° (Dhanus) and his actual position was 156·02° (Kanyā).

259. Among the possible A.D. years which we selected with the help of Table V-A there is only one, other than A.D. 17, in which there was a lunar eclipse in Śrāvaṇa month, and that is the year A.D. 1050; but in that year Mars' increase of mean longitude was +95° which would never give us an actual position for Mars in Mēsha (in fact it yields an actual position 92·57° i.e, 3 degrees in Karkaṭaka, the fourth rāśi instead of the first). Also, in A.D. 1050, neither Venus' mean, nor her actual position, was satisfactory. Therefore, apart from considerations of the probable period of the literary work *Paripāḍal*, A.D. 1050 must be rejected.

260. The fixation of A.D. 17, as a date for the poem, however satisfactory it might be to the upholders of the theories propounded by the late Mr. Kanagasabhai Pillai (in his *Tamils 1,800 years ago*) and by Mr. A. Kumāraswāmi (quoted by Dr. HULTZSCH in *South Indian Inscriptions*, volume II, Part iii, p. 378, 1895), namely, that the extant *Sangam* literature in Tamil was produced in the first century A.D., runs counter to all probabilities, as inferred in paragraph 245 supra, of the period when Indian astronomers could have begun to calculate the movements of the planets. There is a bare *possibility*, as the writer has already hinted, that the South-Indian astronomers received the elements of the planetary motions from a direct Chaldean source in the centuries immediately preceding the Christian era, but it has to be remembered that there is no *evidence* of their having habitually cast horoscopes before the seventh century A.D. If would appear that from Alexander's time at least the Śramaṇas (or Jains) boasted of an astronomical learning equal or superior to that of the Brahmanas, and possibly the Jain astronomy inculcated a knowledge of the planetary motions, and Jains were plentiful in Southern India from the fourth century B.C. There is also a good deal that has a look of great antiquity about it in the way in which the Tamil people have clung to the solar reckoning when all the rest of India practically followed the lunar reckoning, in the peculiar way in which they name some of the solar months when ordinarily all other month-names have been confessedly borrowed from Sanskrit, in the many variations of solar month-names, to be found among primitive tribes in Southern India, e.g., Tulu month names, noted by DR. BURNELL in his *South Indian Palæography*, and Toda month names on the Nilgiris, noted in DR. RIVERS' *Todas*; and lastly in the many synonyms which are to be found, in Tamil only, for the names of nakshatras. (See *Piṅgaḷa Nigaṇḍu.*)

261. Still, before accepting A.D. 17, one would like to know something about the other evidence for the relative age of this poem *Paripāḍal*, as compared with other works of the *sangam* age. Most of the productions of that age which have come down to us have come down only as anthologies, and this is a class of literature peculiar to Tamil. Hundreds of poets are known to have flourished during the *sangam* age in each part of the Tamil country: of a very few of them

like Tiruvaḷḷuvar, Iḷangō-Adigaḷ, Sīttalai Sāttanār, Tiruttakkatêvar (authors of the well-known *Kuṟaḷ*, *Śilappadikāram*, *Maṇimēkalai*, and *Jīvaka Chintāmaṇi*, respectively) we have entire works that have come down to us, as *sangam* works: all the rest are preserved either by name only or in ancient anthologies, called *Padiṟṟuppattu*, *Puṟa-nānūṟu*, *Aha-nāṇūṟu*, *Nāladi*, *Naṟṟiṇai*, *Kuṟuntogai*, etc.; and we are left to conjecture the period during which these poets' works must have been current, each in its entirety, before *their* posterity thought it prudent to preserve them in anthologies or excerpts of their works; and such abridgements must have been necessitated by the rapidly accumulating bulk of literature and the difficulty and expense of making copies of entire works. The careful way, too, in which these anthologies were compiled, the number of genuinely good poets whose remains are, as it were, enshrined in them, and the scrupulous accuracy with which they were annotated by eminent commentators, some of them men not less famous than the authors whom they annotated, must make us pause before we can limit the *sangam* period, (even supposing it came to an end about A.D. 800), to less than three or four hundred years before that date; that is, nobody would have taken the trouble that has been taken with these anthologies or in editing so systematically such minute extracts unless the poets' names were really ancient and nearly as venerable then as they are now. In the allegorical language of the legend associated with the origin of *Nāladi*, the *sangam* editors were so fastidious in their choice that they salvaged only those productions which had resisted the devastating flood of time. See further Paper No. (iii) in Appendix "on the chronology of early Tamil Literature."

262. About *Paripāḍal* itself, its venerable editor in print tells us in his preface that he was able to secure only two manuscripts (which were copies, the one transcribed from the other) containing the extant portions of the anthology (20 out of 70 ancient selections), and certain other manuscripts containing a few fragments: and it is scarcely likely that any portion of this work, not already published by Mr. Swāminātha Ayyar, will ever come to light hereafter and help us to unravel the age of its composition, or, supposing that it really belonged to the first century A.D., to enlighten us as to how the poet acquired his knowledge of planetary astronomy. Even so, other portions of the Paripāḍal anthology which deal with developments of Śaivism and Vaishṇavism seem to be more recent than the first century A.D., if we are to follow Dr. Bhandarkar and other eminent authorities.

263. We have so far given full credit to the ancient commentator Parimēlaḻagar for correctly interpreting the poet, but we have done so at the expense, so to say, of the positions of the inferior planets, to one of which only (viz., Venus) the commentator's hypothesis of sun in Siṁha and a lunar eclipse in Śrāvaṇa month allows even an approximately correct mean position, while Mercury's position, whether mean or actual, has to be abandoned altogether on that hypothesis. Also, the time of lunar eclipse in Śrāvaṇa month in A.D. 17 was not the morning but, as any one may satisfy himself by computing the sun's and moon's anomalies and equations, at ·55 of the day (i.e., an hour after sunset) on the 27th July A.D. 17. This is the first feature that strikes us as defective in the commentator's hypothesis; for the poet says that, when Kṛittikā nakshatra was at or near the zenith at daybreak on a certain day, "presently" (the poet is careful to use the expressive Tamil adverb *ollai*, i.e., "presently"), there was an eclipse of the moon. The poet would not have referred in these terms to an eclipse which had occurred the previous evening or which was to occur in the evening of the day when Kṛittikā was near the zenith in the morning.

264. We are reluctantly led to the conclusion that the commentator was, like ourselves, trying to make the best of an obscure text, but that not having at hand the astronomical tables that we have, he hazarded his hypothesis about the lunar eclipse having occurred in the month of Āvaṇi or Siṁha, when the moon was in nakshatra Dhanishṭhā or Śravishṭhā, simply because Kṛittikā nakshatra was thought by him to be then at or near the zenith, and also fell into the error of supposing that a position of the sun in Siṁha rāśi was compatible with Mercury being actually in Mithuna or with Venus being actually in Ṛishabha.

265. It is somewhat dangerous, even in a purely astronomical speculation, to reject the authority of a commentator like Parimēlaḻagar, but the astronomical

critic cannot discharge his duty unless he exhausts every reasonable alternative that presents itself; and after all, it seems to be more than doubtful whether Parimēlaḻagar was the real author of the commentary on *Paripāḍal* which passes under his venerable name.

266. A lunar eclipse in Āshāḍha month, with the sun about 90° in mean longitude, is no doubt more compatible with actual positions for Venus and Mercury in Ṛishabha (30° to 59°) and Mithuna (60° to 89°) respectively, and we have a year among the A.D. years in our table of moveable years in paragraph 255, when there was a lunar eclipse in Āshāḍha, and that is the year 634 A.D. This eclipse occurred on 17th June 634 A.D., and the exact time of its occurrence, according to the Ārya siddhānta, as will be seen from one of the specimen problems worked out under the Ārya siddhānta Eye-table (p. 159) was 4,42½ a.m. The centre of the eclipse, according to Sūrya siddhānta was the moment of sunrise. (The reader should be able to verify this from Table II and Sūrya siddhānta Eye-table **e**, **h** and **y**.) It looks as if we had got hold of the very kind of lunar eclipse (*grastāsthamana*, i.e., the setting of the moon in a state of eclipse, see paragraph 29) that the poet says he actually beheld. It is true that in making a bid for this eclipse, we are setting aside the *commentator's* hypothesis, that because *Krittikā* (30°) was in the zenith at day-break, the sun must have been in or about 120° sidereal longitude. But the *poet's* description of Kṛittikā may mean "at or near the zenith" and it is just as reasonable to suppose that a Tamil poet using the word *uyar* (உயர்) in this context may have employed it to mean "high up" as that he meant "at the zenith." The eclipse was a partial one of 1½ digits and occurred, according to *L'Art de Vérifier les Dates* (the standard French work quoted in paragraph 134 supra) at 11–30 p.m. in the Paris meridian, i.e., about 4½ a.m. next day in the meridian of Madura. At this time the moon was eclipsed for an hour (see paragraph 135). The point of the ecliptic rising at that hour must have been that which rose two hours before the sun, i.e., the 59th degree of the celestial longitude. Kṛittikā nakshatra whose initial longitude is from 20° to 26° (according to the siddhānta followed) must have been at this time (4 a.m.) at least about one-third way up the heavens. By sunrise Kṛittika would have advanced to a point in the heavens about 30° from the zenith to the east. At 4–30 a.m. the darkness of the eclipse, though it was partial, would be such as to allow stars to be distinguished, notwithstanding the full moon, and Kṛittikā would still be fairly high up; and 4–30 or 5 a.m. is apparently the time indicated by the poet's expression *pular viḍiyal*, i.e., at the first dawn.

267. If we search for a suitable year with a lunar eclipse in Āshāḍha month and with Mars, Jupiter and Saturn in the positions recorded by the poet, we shall want a preliminary table somewhat different from the one in paragraph 250 with which we started. Our starting points for 1 B.C. will then be as follows:—

—	Mars.	Jupiter.	Saturn.
(1) Commencement of Indian solar year in 1 B.C., A.D. 0 ...	254·74°	163·17°	70·54°
(2) Planets' motion for 89 days...	46·64°	7·39°	2·98°
(3) Total ...	301·38°	170·56°	73·52°
(4) or in nearest degree	302°	171°	74°
(5) Positions recorded by the poet	0° to 29°	330° to 359°	270° to 299°
(6) Mean positions corresponding to those recorded *by the poet* (by Planetary eye-tables)	314° to 347°	320° to 350°	274° to 303°
(7) Number of degrees to be added in each case to (4) in order to arrive at (6)	12° to 45°	150° to 180°	200° to 230°

For Mars we shall now want an increase of longitude (over and above his 1 B.C. longitude) of 12° to 45°, for Jupiter 150° to 180°, and for Saturn 200° to 230°. We see that these limits are not such as to modify our second table or table of moveable years, on page 103, that is to say, the years included by us in that table will serve us as the possible years in this case also. And there is only one year among the A.D. years included by us in the table on page 103 which had a lunar eclipse in Āshāḍha. The possible year 398 B.C. when the sun was in Ṛishabha has to be rejected, because Mars, at the eclipse of that year was, as already stated

(paragraph 256) not in Mēsha. (If Bhādraṇapada or Jyeshṭha were suitable months for the lunar eclipse and for the sun's position, we would have to change our starting table again, but we know—paragraphs 248 and 256—that the month of Bhādrapada would be too late for thé recorded positions of Mercury and Venus and in Jyeshṭha the sun would be too near Kṛittikā nakshatra. Moreover our second table would not be different for Jyēshṭha, for which the limits of increase of longitude for Mars would be — 9° to + 30°, limits already included in our table of moveable years, and in that table there is no lunar eclipse in Jyeshṭha.)

268. The mean longitudes of the five planets at mean sunrise (6 a.m.) on 17th June A.D. 634 (full moon tithi of lunar Āshāḍha month when the moon was in a state of eclipse), were as follows:—

	Mars.	Jupiter.	Saturn.	Venus.	Mercury.
Mean longitudes	331·92°	330·83°	262·41°	296·23°	371·56°

and the actual positions, whether we follow the instructions in paragraphs 237 and 239 supra, or the much simpler processes by the Eye-tables, or by Tables V-A and V-B, fully illustrated in the next two sections of this chapter (pp. 112 and 133) were—

actual geocentric places	16·12°	339·53°	256·51°	41·53°	70·38°
and the Rāśis	Mēsha.	Mīna.	i.e., second-half of Dhanus, 13° short of Makara.	Rishabha.	Mithuna.

This seems far more satisfactory than the uncertainties in which we were landed by our first attempt to follow the ancient commentator's hypothesis at all costs. All the planets are now in the actual positions recorded by the poet and we have not lost even one, not even Mercury, though we made no special endeavour to search either for that planet or for Venus. It is true that our result for Saturn is 13° short of Makara but that in all probability is what the poet himself means. His verse (see page 109 below) may be translated: "Saturn was at the end of *vil* (i.e., Dhanus) and was going to Makara," which makes much better sense of the text than the commentator's gloss: "Saturn was in the rāśi following Dhanus, i.e., in Makara." Moreover, as happily pointed out to the author by Mr. Manikka Nayagar, Tamil *virkadai* might mean what the commentator says, but Tamil *cillirkadai*, the expression actually used by the poet, can only mean "*at the end of vil*, i.e., of *Dhanus*" not "after Dhanus." The commentator is, however, right in noting that the poet evidently views with satisfaction the fact that each of the planets Mars, Jupiter, Saturn, Venus and Mercury was either in his own house (svakshetra) or, (in the case of Saturn) going to it. In astrology, Mars permanently owns, or is lord of, Mēsha, Jupiter is lord of Mīna, Saturn of Makara, Venus of Ṛishabha, and Mercury of Mithuna. A planet like Saturn going to his own house is said to be very powerful, even though he may not be actually in it. We have also to note (see paragraph 297 below) that according to the Sūrya siddhānta, Saturn's place in 101 B.C. was 6° in advance of the place assigned to him in this work, and in A.D. 900, the planet occupied nearly the same place as he would by this work. In A.D. 600 his place by Sūrya siddhānta must have been at least 2·4° in advance of what is deducible from the present work. We say "at least" 2·4°, because subsequently a bīja was admitted in the case of Saturn which, if it had been accepted or adopted in A.D. 634, would have had the effect of advancing by several degrees the position of Saturn, just what we want in order to satisfy the commentator; but we must at the same time remark, that the bīja was in all probability adopted after A.D. 900 when the position of Saturn by Sūrya siddhānta began to fall behind his actual position in the heavens (see Table in paragraph 297, page 121 below, and also Burgess' *Sūrya siddhānta*, page 165, and Bentley's *History*, page 126). We may take it that Saturn's mean place by Sūrya siddhānta was about 260° or 10° short of Makara. What tables were used in India in 634 A.D. for ascertaining Saturn's actual place we do not know. On the particular morning in question, Saturn was above the horizon when the sun

was rising (sun being in 86th degree and Saturn in 256th of longitude). About 5 a.m., Saturn may have been just above the horizon or just below it; but the poet evidently was able to calculate where Saturn was at the time, whether or not he saw it in the heavens during the eclipse.

269. The poet does not say that the sun was in Siṁha; which he would surely not have omitted to note if that had been the case, because Siṁha is the sun's own house and the poet evidently noticed the fact that the five planets Mars, Jupiter, Saturn, Venus and Mercury were each in (or going to) his own house. The moon's own house is Karkaṭaka or Cancer, and the moon just then was in Dhanus (2: 6° mean longitude).

270. On the whole, we need have no doubt now but that the poet was writing about the lunar eclipse which happened at or a little before sunrise on 17th June A.D. 634; and if our solution is at all near the mark, it furnishes us with a very reliable landmark in the history of Tamil *Sangam* literature, a landmark which, incidentally, is in perfect accord with another which was brought to light by the author some years ago, viz., the date A.D. 756 to be inferred from *Śilappadikāram*.* If Tables V-A and V-B had rendered to chronology no other service than to enable us to solve this one chronological riddle, they would be worth all the trouble expended on their compilation. Table V-A is most useful when we know for certain the solar or the lunar month of a horoscope; but it is equally useful when we have to guess the month in the first instance; for the positions of Mercury and Venus will then enable us to make a rough guess of the month, and for Mars we need only a table of moveable years with fairly wide limits of increase of longitude, like the one we actually framed with the help of the Mars Eye-table. The limits of Jupiter and Saturn do not vary very much, as we may see from their Eye-tables, for one month or for another. It is well to note thus the different ways in which our tables of fixed and moveable years should be adjusted to suit the mean and actual movements of the different planets.

271. The author has already taken the opportunity, in paragraphs 216 to 219, to warn the reader that in fixing the mean sidereal periods of planetary revolutions adopted in this work, he has followed, so to speak, no particular siddhānta but a siddhānta of his own. The reasons for this unusual procedure on his part are (1) that no two siddhāntas agree in this important matter, (2) that *bījas* are freely admitted for planets in the Indian siddhāntas, and one can never be certain in epigraphical research whether a particular record did or did not make allowance for *bīja*, (3) that one never knows which siddhānta to follow, (4) that where there is an antecedent probability, as in the case of the visible planets, that the person who framed a record did so after checking his calculations by ocular observation of the planets themselves in the heavens, more weight should be attached to the actual position of the planets, as a guide in fixing the time of the record, than to the particular siddhānta which may have been followed or to the particular *bīja* which was or was not allowed for. Experience, and the unsolicited testimony of numerous correspondents, particularly of Mr. Ketakar, the well-known author of "*Jyōtir-Ganita*" has shown that the present author in employing his own planetary siddhānta in Table V-B, has hit off, very accurately, for purposes of historical research, the actual positions of all the five planets. In the particular case expounded in this section, the place assigned to Saturn agrees very well with that which would follow from Professor Jacobi's Tables published in *Ep. Ind.*, Vol. XII (1912). The mean place of Saturn on the day in question was, according to Professor Jacobi, 294° + 322°, 37′ + 5°, 33′ or 262°, 10′ whereas the mean place found above and fully worked out in paragraph 239 supra is 260°, 24′, 6″. (It has already been shown in paragraph 268 that according to Sūrya siddhānta, without *bīja*, which Professor Jacobi follows, Saturn's place in A.D. 634 must have been 2° in advance of that arrived at by means of this work.) The actual place, according to Professor Jacobi, must be equally close to the actual place arrived at above, because his tables, like those in Table IV of this work, are taken from Warren, who adopted them from *Vāviḷāḷa Kuchinna*, a Telugu astronomer of the twelfth or thirteenth century A.D.

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* See paper iii in the Appendix, "Notes on the Chronology of Early Tamil Literature."

Paripāḍal, canto 11, *lines* 4–-10.

(Edition of 1918 by Mahāmahōpādhyāya V. Swāmināṭha Ayyar.)

The Tamil Text.

Urugeḻu veḷḷi vandēṟṟiyal sēra
varuḍayyay ppaḍimakan vāyppa pporuḍeri
puṇḍi mitunam porunda ppularviḍiya
lanki[1] yuyarniṟpa vandaṇaṇ pankuvi
ṇillattuṇaikkuppā leyda viṟayamaṇ
villiṟ kaḍaimakara[2] mēvappām pollai
maḍiya maṟaya[3] varunaḷil.

உருகெழு வெள்ளிவந் தேற்றியல்சேர
வருடையப் படிமகன் வாய்ப்பப் பொருடெரி
புந்தி மிதுனம் பொருந்தப் புலர்விடிய
லங்கி யுயர்நிற்ப வந்தணன் பங்குவி
னில்லத் துணைக்குப்பா லெய்த விறையமன்
வில்லிற்கடைமகர மேவப்பாம் பொல்லை
மதிய மறைய வருநாளில்.

English translation.

"On a day when bright Venus joined with the Bull, when Mars obtained the Ram, when wise Mercury joined with Mithuna, at the first dawn, when Kṛittika stood high[1] up, when Jupiter was beyond the two houses of Saturn, and when Saturn was at the end of Dhanus and going to Makara, and Rāhu[3] was fast causing an eclipse of the moon . . . "

Parimelaḻagar's Commentary.

[1] "The poet says that Kṛittika was on high at daybreak in order to indicate that the sun was in Siṁha.

[2] "i.e., when Saturn, the brother of Yama, had reached Makara which comes after Dhanus.

[3] "The meaning of pāmpollai . . . varunāḷ is that it was Śravishṭha nakshatra on the full-moon day of the month of Āvaṇi. Therefore, it is evident that the moon and Rāhu were in Makara, and Kētu in the seventh house from Makara, i.e., in Karkaṭaka."

"The sense of the passage is 'at an eclipse of the moon on a day of nakshatra Śravishṭha in the month of Āvaṇi, when the planets were in the rāśis which are their own houses.' "

SECTION III.—*Perpetual Planetary Almanac.—Ascertainment of the actual place of a planet* (*Mars, Jupiter, Saturn, Venus or Mercury*) *on any day in any year between* 3102 *B.C. and A.D.* 2000.—*Rama's and Sankara's horoscopes.*

272. The reader who has followed attentively the observations made in the last section will have noticed (1) that it is a comparatively easy matter, with the help of Table V-A, to ascertain the year or years in which the planets Mars, Jupiter and Saturn attained any specified mean longitudes, but (2) that it is by no means easy to arrive at the actual places of these planets on the dates that we wish to examine, if our method of computation is to be that prescribed in paragraphs 237 and 239; and (3) that the ascertainment of the *mean* longitudes of Mercury and Venus in any year does not give even a rough indication of their *actual* places which depend mainly on the sun's longitude and to a very minor extent on the mean longitudes of the planets themselves. Much of our difficulty would disappear, if having been given a particular *mean* longitude for a planet, we could ascertain at once, without going through the 12 steps described in paragraphs 237 and 239 *supra*, the *actual* place of the planet. It is proposed to show in this section how the task of the investigator in this respect can be simplified without any risk to the accuracy of the result.

273. The most useful device in astronomy for calculating the moments of occurrence of phenomena in times long past is by means of cycles of recurrence. It will be shown in an appendix that the body of the present ephemeris was constructed upon a basis of cycles of recurrence in respect of the ending moments of tithis and nakshatras and their equations. In the same way we can make use of certain cycles of recurrence in the case of planets also. The principal cycles of recurrence for planets are noted at the beginning of Table V-A and the reader will do well to study carefully the effect of each cycle which will be explained presently. We learn from the *Encycl. Brit.* (11th Edition) art. *Astronomy, History*

of —, that the Babylonians of the second century B.C. used some of the very cycles of which we are about to learn the use, viz., 79 years for Mars, 46 years for Mercury, 83 years for Jupiter, 8 years for Venus and 59 years for Saturn.

But we want longer cycles than these if we wish to extend our calculations over long periods of time without sacrifice of accuracy. The most useful cycles for our purposes are accordingly the following, to most of which the reader has already been introduced in paragraph 222 :—

(1) For Mars, 363 years ; increase of mean longitude	...	+ 0·107944°
(2) For Jupiter,* 605 years ; increase of mean longitude	...	+ 0·19714°
(3) For Saturn, 383 years ; decrease of mean longitude	...	− 0·091536°
(4) For Venus,* 235 years ; decrease of mean longitude	...	− 0·3897°
(5) For Mercury, 355 years ; decrease of mean longitude	...	− 0·091505°

There are other cycles which are tabulated at the beginning of Table V-A, but the above are so important that an investigator should be able to recall them and the corresponding increases or decreases of longitude from memory to at least two decimal places.

The meaning of the above cycles of recurrence is this : After 363 years from any given date, reckoned by the solar day of any Indian year, say the 10th solar day, the 100th solar day, the 125th solar day, etc., of Indian solar year 1 B.C. or A.D. 0, the planet Mars returns to the same mean longitude as at the beginning of the period of 363 years, increased by ·11°. Now the actual position of Mars is determined by a certain algebraical addition to his mean longitude, which addition in turn depends upon the difference between the mean longitudes of the sun and Mars on that date and the difference between Mars' apsis and Mars' mean longitude. On any given solar day, say, the 10th, the 20th, the 200th, or the 325th day of the Indian solar year, etc., the sun's longitude is always the same from year to year, the very slight variations noticed in paragraph 189 supra being negligible for our present purpose; and the longitude of the apses of all our five planets do not vary from year to year as will be seen from Table IV. Consequently, when Mars' mean longitude on any solar day of the year is the same or practically the same as on the same solar day at the beginning of our 363-year period, it follows that his actual place must also be the same as at the beginning of that period. The same observations apply to Jupiter after 605 years, to Saturn after 383 years, to Venus after 235 years and to Mercury after 355 years, making allowance for the fact that the actual places of Venus and Mercury follow closely those of the sun. Since the increase or decrease of longitude after each of these cycles of recurrence is less than half a degree, it follows that even after four cycles of recurrence, which in the case of the shortest cycle, that of Venus, is equal to 1,040 years, the difference in mean longitude is still negligible for our purpose; indeed, in the case of Jupiter, Saturn and Mars, which are the most important planets, we may repeat the cycles of recurrence up to 2,000 years without any sensible difference in the actual place of any of these planets ; and in the case of Venus there is an important cycle of 948 years (noticed in paragraph 222 supra) which makes it possible to construct out of our cycle of 235 years a table of geocentric places for Venus for 10,000 years without any appreciable risk of error.

274. If, therefore, we could calculate the actual places of planets for 235 years in the case of Venus, for 355 years in the case of Mercury, for 363 years in the case of Mars, for 383 years in the case of Saturn and for 605 years in the case of Jupiter, we should have the means at our disposal for ascertaining the actual places of these planets on any day in any year for a period of 2,000 or any number of 1,000 years forwards or backwards. Table V-B gives the actual places of these planets for every 10 days, for 235 years in the case of Venus, for 363 years in the case of Mars, for 344 years in the case of Jupiter, for 383 years in the case of Saturn and for 355 years in the case of Mercury. In the case of Jupiter alone, the cycle fully calculated in Table V-B, and used in Table V-A, is shorter than the cycle of 605 years first mentioned, but the shorter Jupiter's cycle of 344 years, combined with a still shorter cycle of 261 years, is capable of yielding results fully equal in accuracy to those obtainable with the major cycle of 605

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* Jupiter's cycle of 1554 years and Venus' cycle of 948 years were used in paragraph 222 *supra* in preference to the shorter cycles of 605 and 235 years here mentioned.

years. After 344 years, Jupiter's mean longitude is changed by — 0·46832° ; after 261 years more his mean longitude increases by + 0·69111°, so that at the end of 344 + 261 or 605 years, his mean longitude increases by 0·69111° — 0·46832° = + ·2227°, the figure given above. It would of course be more satisfactory if we could have tables of actual places calculated to the longest periods of recurrence in the case of all the planets, but two considerations prevented the author from attempting such a gigantic task. The first was that the calculation of tables of actual places is a tedious process and is recognized as such by astronomers in the west as well as in the east. For the Indian Chronology (1911), and the first instalment of " Indian Ephemeris, A.D. 1800 to A.D. 2000" (published in 1915), the author calculated the actual places of planets for every 10 days in the year from A.D. 1840 to 1999—2000 A.D., in all about 160 years. These places have now been extended, as will be seen from Table V-B, to 235 years (Venus), 344 years (Jupiter), 383 years (Saturn), 363 years (Mars) and 355 years (Mercury). The second consideration was that so little use is likely to be made of these lists of actual places for the purpose of *historical* investigation, that it did not seem worth while to expend the additional time and trouble that would be necessary for constructing tables for cycles of recurrence longer than the above, when no corresponding improvement in the accuracy of results was in prospect. The single example of a useful planetary investigation in Tamil literature, commented on in section (ii) of this chapter, encouraged the author to expand his original table for 160 years into the present Table V-B, which is practically a perpetual planetary almanac, and which ought to answer the needs of the most fastidious investigator.

275. In order to use Table V-B for historical investigation, it is necessary to take from it the geocentric places of the planets for a particular day and apply them to any year past or future according to the key furnished in columns 5—9 and 11—15 of Table V-A. Column 1 of Table V-A gives the list of years from A.D. 1 to A.D. 2000, while column 10 of the same table gives the list of B.C. years from 1 B.C. to 1024 B.C. The reader will please note that columns 2, 3, 4 of Table V-A give the increase or decrease of mean longitudes of the three principal planets Mars, Jupiter and Saturn for any number of years reckoned forwards or backwards from a fixed year. The further use to be made of these columns in historical investigations has been fully explained in section ii of this chapter, paragraph 251, etc. The reader is, therefore, now concerned only with column 1 and columns 5 to 15 of Table V-A. An illustration will best show how these columns are to be used in conjunction with Table V-B. The first line of Table V-A reads as follows (omitting columns 2, 3 and 4, the use of which has been fully explained in section ii of this chapter).

Table V-A.

Col. 1	Col. 5 Mars.	Col. 6 Mercury.	Col. 7 Jupiter.	Col. 8 Venus.	Col. 9 Saturn.	Col. 10 B.C.	Col. 11 Mars.	Col. 12 Mercury.	Col. 13 Jupiter.	Col. 14 Venus.	Col. 15 Saturn.
A.D. 1	1816	1776	1816	1897	1916	1	1815	1775	1815	1896	1915.

This means that if we wish to know the actual position of Mars, say, on the 200th day of the Indian solar year in A.D. 1, it was the same (with a small cyclic variation) as Mars' actual place on the 200th day of A.D. 1816 (Table V-B); Mercury's actual place on the 200th day of A.D. 1 was the same as his actual place on the 200th day of A.D. 1776 (Table V-B) ; Jupiter's actual place on the 200th day of A.D. 1 was the same as his actual place on the 200th day of A.D. 1816 (Table V-B.); while Venus and Saturn, on the 200th day of A.D. 1, stood exactly where they stood, according to Table V-B on the 200th day of A.D. 1897 and A.D. 1916, respectively.

Similarly the actual places of the five planets on the 100th day of 1 B.C. were the same as their actual places on the 100th day of A.D. 1815, of A.D. 1775, of A.D. 1815 of A.D. 1896 and of A.D. 1915, respectively.

These places can be verified by actual calculation and they will be found to be the same as those given by the key in Table V-A, the cyclic variation in no case exceeding a degree. In the case of Mars, Jupiter and Saturn the exact variation is found as follows from the interval between the given year and the year which corresponds to it in the current cycle.

(Mars) The interval between A.D. 1 and A.D. 1816 is 1,815 years = 5 × 363 years.

The cyclic variation in Mars' place for 5 cycles of 363 years each = 5 × (+·107 degree) = + ·535 degree or 32′.

(Jupiter) The interval between A.D. 1 and A.D. 1775 = 1554 + 261 years. The cyclic variation in Jupiter's place for this interval = —·09 + ·68 = + ·59 degree or 36′.

N.B.—1554 years is a major cycle of Jupiter, vide paragraph 222 supra.

(Mercury) The interval between A.D. 1 and A.D. 1776 = 1,775 years = 5 × 355 years.

The cyclic variation in Mercury's *mean* place for this interval is 5 × (+·09) = +·45°, but since Mercury's *actual* place depends mainly on the sun's place and to a comparatively minor extent on his own mean place, it will be found by calculation that Mercury's place in A.D. 1 did not differ by even ·45 of a degree from his place on the same solar day in A.D. 1776.

The same remark applies to Venus, in whose case the interval between A.D. 1 and A.D. 1897 = 1,896 years = a major cycle of 1,661 years + a cycle of 235 years.

(Saturn) The interval between A.D. and A.D. 1916 is 1,915 years = 5 × 383 years. The cyclic variation in Saturn's place corresponding to this interval is only 5 × (— ·08) = — ·40 degree or only 24 minutes.

276. An actual example from a case with which the reader is already familiar will show not only the practical use of Table V-A in historical investigations but also the degree of accuracy—a very important point—which we may expect to attain by its means. Supposing we take the mean positions of the planets for any one of the years in the table of moveable years in paragraph 254 supra and wish to know the actual places of the planets on that particular date, taking first the year A.D. 634 which we found was a probable year, the actual longitudes (called geocentric places) of the planets at the completion of 89 days of the solar year in the year A.D. 634 were as follows :—

Places of planets on 89th complete solar day, A.D. 634.

[For the method of obtaining from the column "90 days" in Table V-B the places of the planets on 89th complete day, see N.B. to paragraph 285 below] :—

			Table V-B.	Actual place ascertained by calculation, paragraph 237 or 239.
Table V-A.	Mars	A.D. "1723" —·3 = 17·8 —·3	= 17·5°	17·12
"	Mercury	A.D. "1699"	= 70·4°	7·04
"	Jupiter	A.D. "1844" —·4	= 340·5°	340·5
"	Venus	A.D. "1817"	= 42·3	41·6
"	Saturn	A.D. "1783" +·3	= 256·4°	256·4

The A.D. years entered above are the years in the current cycle (Table V-B) in which the several planets attained the same places as they did in A.D. 634. The decimal places, — ·3, — ·4 and + ·3 are the cyclic variations.

It will be seen by comparison with the results of actual computation in paragraphs 237 and 239 that practically correct results can be obtained as above by mere inspection of Tables V-A and V-B. In the same manner we can obtain the actual places of the five planets for any of the other years tabled in paragraph 255 supra and satisfy ourselves that the year A.D. 634 is the only suitable date.

277. We may consider another example, that of Rāma's horoscope, along with which we may treat Śankara's horoscope as given in Mādhavachārya's *Śankara-vijayam*. We are told, in Vālmīki's Rāmāyana, that Rāma was born "in the twelfth month Chaitra (this is the southern version), on the ninth tithi, on a day of nakshatra Punarvasū, when five planets were in their houses of exaltation, and when Jupiter was in Karkaṭaka, as lagna, along with the moon" Mr. M. N. Dutt's translation of the Rāmāyana, which presumably follows some northern version, has : "and then, when the six seasons had rolled away after the completion of the sacrifice, in the twelfth month, on the ninth lunar day, under the influence of the Punarvasū asterism, when the sun, the moon, Saturn, Jupiter and Venus

were at Aries, Capricorn, Libra, Cancer and Pisces, and when Jupiter had arisen with the moon at Cancer, Kauçalyā gave birth to the Lord of the Universe."

278. We may follow the southern version as being self-consistent, while Mr. M. N. Dutt's version places the moon simultaneously in its house of exaltation (Rishabha) and in the lagna (Karkaṭaka) which is impossible. The first *Moon* in Mr. M. N. Dutt's version is probably a printer's error for *Mars*, because *Capricorn* or *Makara* is Mars' house of exaltation, not the moon's. The reader unacquainted with astrology may have to be told that a planet's own house (vide paragraph 268 supra) is different from the house of exaltation now in question.

279. We may take it then, that the five planets in exaltation in Rama's horoscope were, —the sun in Mēsha (0° to 29°), the moon in Ṛishabha (30° to 59°), Mars in Makara (270° to 299°), Jupiter in Karkaṭaka (90° to 119°), and Saturn in Tula (180° to 209°).

280. We note that the month, solar or lunar, in which Rāma was born is described as the twelfth month. Chaitra month is mentioned in the southern version, and Chaitra can be described as the twelfth month only with reference to the solar year, since it is the first month of the lunar year (paragraph 152 *supra*). When the Rāmāyana was first composed, i.e., some few centuries before the Christian era, we may be certain that the practice of casting horoscopes at the birth of a a child, however royal or divine, was entirely unknown, and it is very doubtful if the Hindus of that age were acquainted with the names, much less the movements, of any planets other than the sun and the moon. As already surmised (paragraph 245), the practice of casting horoscopes must have come into vogue about the time of Varāhamihira (sixth century A.D.) and the casting of Rāma's horoscope, whether it was deliberately cast with reference to a particular date, or merely imagined with reference to the supposed superexcellence of the planets presiding over his birth, may be ascribed to the fifth or sixth century A.D. (BENTLEY in his *Historical View of Hindu Astronomy* —vide page 115 below—ascribed it to the second or third century A.D.). There is good reason to suppose that the second of the motives here suggested really dictated the terms of this famous horoscope, the more so as we find exactly the same attempt made, and with the same planets, except Venus, in the case of Śankara's horoscope. Omitting Venus, we shall find that the same investigation, following the method indicated in this and the previous sections of this chapter, will do for both Rāma's and Śankara's horoscopes, supposing we decide to treat them as genuine horoscopes.

281. The mention of the month Chaitra as the twelfth month of the luni-solar year in the case of Rāma's horoscope is perfectly consistent with the solar month having been the first of the solar year, because we are given to understand, at any rate by a probable inference in the case of Rāma's horoscope, that the sun was in Mēsha.* In Śankara's horoscope, according to Mādhavāchārya's *Sankara-vijayam*, the Sun, Mars, Jupiter and Saturn were occupying exalted positions. That the moon at the time of Śankara's birth was in nakshatra Ārdrā and in the fifth śukla tithi is the common tradition and we may accept these details, at any rate, as a working hypothesis.

282. In order to determine the years in which Rāma's and Śankara's horoscopes would be true horoscopes, we may follow the method of investigation explained in detail in section ii of this chapter, paragraphs 250 to 255 supra. That is, we may first of all construct a table for a fixed year for which purpose we may again adopt the convenient year, 1 B.C. or A.D.0: this will suit both Rāma's and Śankara's horoscopes. Referring to paragraph 250 we notice that it is necessary first of all to settle as approximately as possible the day of the solar year corresponding to the horoscope. In the case of Rāma's horoscope, the tithi is śukla navamī in Mēsha month; and in the case of Śankara, it is śukla panchami in the same month. The lunar month to which these tithis belonged may have commenced a few days before Mēsha month or it may have commenced any time from 0 to 29½ days after the commencement of the Indian solar year, because we are not told whether the lunar month was Chaitra or (as in the case of Buddha) Vaiśākha. We may take ten days after the commencement of the Indian solar

* The well-known inconsistency in Rama's horoscope, viz., that between the 9th tithi when the moon must have had a longitude of at least 96° and Punarvasu nakshatra which by all systems cannot extend beyond 93⅓° of longitude, may be mentioned parenthetically, but we do not propose to notice it further on this occasion.

year as a fair average for the ninth or fifth sukla tithi of the lunar month with which the horoscopes are concerned. The mean longitudes of the three major planets (neglecting Venus for the present) were :—

	Mars.	Jupiter.	Saturn.
Longitude on 0 day, A.D.0 (Table IV) ...	254·7	163·2	70·5
Mean motion for 10 days (Table IV) ...	5·2	0·8	0·3
	259·9	164·0	70·8
In whole numbers ...	260	164	71
To obtain the actual positions necessary for the two horoscopes, viz. ...	270° to 299°	90° to 119°	180° to 209°
We have, by the eye-table, as corresponding mean positions	240° to 270°*,	97° to 127°,	175° to 205°
To reach these mean positions, we have, in the case of Rāma's horoscope, to deduct from the positions on the tenth day of the Indian solar year A.D. 0; or add algebraically.	−350° to −20°,	−37° to −67°,	−226° to −256°
And in the case of Sankara's horoscope, we have to add	+340° to +10°,	+ 293° to +330°,	+105° to +140°

283. We have now to search in Table V-A for the following quantities which being subtracted, or added, as the case may require, will give us the positions required respectively for Rāma's and Śankara's horoscopes :—

	Mars.	Jupiter.	Saturn.
Table V-A.—Subtract (for Rāma's horoscope) or add algebraically	−350° to −20°	−37° to −67°	−226° to −256°
Table V-A.—Add (for Śankara's horoscope)	+340° to +10°	+293 to +330°	+105° to +140°
We find without much difficulty that the following quantities, indicating the year A.D.0 minus 963, or 964 B.C., satisfy the mean longitudes of Rāma's horoscope,	−5°	−65°	−247°
while the following quantities from the same Table V-A, indicating the year A.D. 805, satisfy Śankara's horoscope ...	+1°	+310°	+116°

284. We have now to calculate the exact day of the solar year on which the tithi śukla 9 fell in the case of Rāma's horoscope and the tithi śukla 5 in the case of Śankara's horoscope.

		First new moon in solar year.
Rāma's horoscope.	964, B.C.	
Sūrya siddhānta Eye-table, **k** B.C. 1001	Mar. 5·2266	**l** 4·9123
n 37 years	·5740	**o** 10·4353
		d 8·8592
d 9 tithis		
	24·2068	24·2068
	March 30·0074	
Śankara's horoscope A.D. 805.		
Eye-table, **k** A.D. 800	Mar. 20·9883	**l** 8·1606
n (5 years)	·2938	**o** 4·6027
d (5 tithis)		**d** 4·9218
	17·6851	17·6851
	A.D. 805 Mar. 38·9672	
	i.e., Ap. 7·9672	

We assume that Rāma's birth took place at the end of 24 days of the Indian solar year 964 B.C., and Śankara's at the end of 18 days of the Indian solar year, A.D. 805, and proceed to verify the two horoscopes with the aid of Tables V-A and V-B.

285. From Table V-A we learn that the positions (true geocentric places, not merely mean longitudes) of the several planets on the twenty-fourth day, 964 B.C.

* The necessity for a reference to Mars' Eye-table has been pointed out in paragraph 253 supra; it was pointed out in the same place that the Eye-table is not so necessary in the case of Jupiter and Saturn.

(= A.D. 0 *minus* 963), and on the eighteenth day, A.D. 805, were, practically and, except for small cyclic variations, very nearly, the same as their positions in certain years of the current cycle (Table V-B).

Years in the current cycle (Table V-B) when the several planets attained the positions required for the two horoscopes.

—	Mars.	Jupiter.	Venus.	Saturn.
Rāma's horoscope— Table V-A, 24th day, B.C. 964, or A.D. 0 *minus* 963, corresponds in the current cycle, to 24th day of	A.D. 1862	A.D. 1801	A.D. 1881	A.D. 1718
Table V-B, on the 24th day of these several years the planets' geocentric places and the cyclic variations were	= 298·0° − ·3° or 297·7° (28° in Makara).	= 94·7° − ·3° or 94·4° (4° in Kaṭaka).	= 21·3° (in Mēsha).	= 188·1° + ·7° or 188·8° (8° in Tulā).
Śankara's horoscope— Table V-A, 18th day, 805 A.D., corresponds in the current cycle, to 18th day of	A.D. 1894	A.D. 1671	...	A.D. 1954
Table V-B, on the 18th day of these several years the planets' geocentric places, and the cyclic variations were	= 299·0° − ·3° or 298·7° (19° in Makara).	= 108·2° + ·20 or 108·4° (18° in Kaṭaka).	...	= 192·9° + ·3° or 193·2° (13° in Tulā.)

N.B.—(1) In taking out the geocentric places from Table V-B, we should remember that that table gives the position for every tenth day in the year and that for intermediate days we should take proportional parts. Thus, for Mars' position in Rama's horoscope we have to take the position of the planet on the twenty-fourth day of A.D. 1862 and subtract ·3°. Now the position of Mars on the 20th day of A.D. 1862 was by table V-B, 295·3° and on the 30th day 302·1°; increase for 10 days, 6·8°: therefore, the increase for 4 days is 4 × ·68 = 2·72°, or 2·7° and Mars' position on the 24th day of 1862 A.D. was therefore 295·3° + 2·7° = 298·0°; while its position on the twenty-fourth day of B.C. 964, was 298·0 − ·3° = 297·7° or 18° in Makara. We have to proceed in the same way for all the other planets.

(2) The positions in the two years, 964 B.C. and A.D. 805 are the positions required by the horoscopes (if we remember that the solar month in both cases was Mēsha and that the sun was therefore in his house of exaltation, equally with the other planets named above); but in Rāma's horoscope Venus ought to be in Mina (330° to 360°) according to Vālmiki whereas on the 24th day in B.C. 964, Venus' position was 21·3° or 21 degrees beyond Mina.

When we come to study more closely the movements of Venus, we shall find that in most years she is in or beyond Mēsha at the beginning of the Indian solar year: that only in certain years she is at this time in Mīna (330° to 359°); that once she is in Mīna, she continues to return thereto every 8 years; and that lastly, 964 B.C., was not the kind of year when Venus would in Mēsha month be in the constellation Mīna.

Evidently we have to make a second attempt, as we did in the case of the Paripādal horoscope, in section (ii), paragraph 263, and for the same reason, namely, that we have failed so far to get a correct position for Venus. But before doing so we may devote some time to a consideration of Bentley's solution of this problem.

286. In a well-known and otherwise valuable and suggestive work entitled "*Historical View of Hindu Astronomy*" (1825), Bentley says:—

"According to the Rāmāyana, called Valmiki's, five of the planets were in their houses of exaltation, as the astrologers term it, at the birth of Rāma, that is to say, sun in Aries, moon in Cancer, Venus in Pisces, Jupiter in Cancer, Mars in Capricorn, Saturn in Libra, on the ninth lunar day of Chaitra. The position of the planets here given, I strongly suspect, are the result of modern computation and not from actual observation; for the signs of the ecliptic, at least by these names, were totally unknown in the time of Rāma and were not introduced into India until the second or third century A.D.

Rāma born on 6th April 961 B.C.

(By Lalande's tables.)

	s	°	′	″	
Sun	0	6	11	23	Aries.
Moon	3	12	13	54	Cancer.
Venus	11	1	0	0	Pisces.
Mars	10	2	47	0	Capricorn.
Jupiter	4	6	24	13	Cancer.
Saturn	6	8	27	0	Libra.

in which Jupiter is only 6° 24′ 13″ beyond the limit and Mars 2° 47′. Rāmāyana, B.I Sarga 3, Verse 16."

287. The reader who has carefully noted the mean annual movements of the planets (paragraph 222 *supra*) will probably be inclined to ask how it was possible for Jupiter and Saturn which were in certain signs in 961 B.C. according to Bentley to occupy the same signs in 964 B.C. according to paragraph 285 *supra*. We found that Jupiter's position in 964 B.C. on Mēsha sukla navamī was, according to the Ephemeris, 94·4° while, according to Bentley, on much the same solar day in 961 B.C., his position was 126·3°, an advance of 32° for three years, whereas Jupiter advances at least 30° every year or 90° in three years. Again Saturn's position, according to the Ephemeris, on Mēsha sukla navamī in 964 B.C. was 188·8° or 189° whereas, according to Bentley, he was in the same sign in 961 B.C. and was occupying a position defined by Lalande's Tables as 188·4°. That Saturn in 3 years should not have moved even one degree must land the reader in the conviction that either Bentley or the Ephemeris is wrong.

288. In the first place, we observe that Bentley assigns to the sun only 6° of longitude on Ap. 6, 961 B.C.; in other words that 6th April was, according to him, the sixth or seventh day of the solar year, whereas we know from Eye-table sec. **k** that it was not till A.D. 1751 that the Indian solar year began to commence as late as March 29, and that 6th April was only then the eighth day of the Indian solar year. We know also from section **k** of the Eye-table that in 961 B.C., April 7 was the thirty-second day, and not the seventh day of the Indian solar year.

289. An explanation of these serious discrepancies between Bentley's figures and those furnished by the *Ephemeris* is to be found in the facts that Bentley follows the ordinary European reckoning of celestial longitude (vide paragraph 230 supra) which starts from the First Point of Aries, or the meeting point of the equator and the ecliptic; whereas Indian celestial longitudes are reckoned from this meeting point as it stood in a particular year, *circa* A.D. 532; that on account of precession, the First Point of Aries has since A.D. 532, moved westward at the rate of 50 seconds of an arc per annum; that for every year before A.D. 532, the First Point of Aries must be shifted to a position east of that which it occupied in A.D. 532; that in 963 B.C. the First Point of Aries was fully 24·3 degrees (paragraph 229) east of the point where Indian celestial longitudes commence; that consequently in order to convert the positions in Bentley's horoscope into those of an Indian horoscope, we should add about 24·5 degrees to each of Bentley's positions; in other words, Bentley's horoscope would read as follows in terms of the Indian sidereal year:—

Sun	30° 41′
Moon	126° 43′
Venus	355° 30′
Mars	327° 17′
Jupiter	150° 54′
Saturn	210° 57′

290. According to Bentley's horoscope, sidereally construed, none of the planets except Venus was in the position required for Rāma's horoscope, unless we suppose that the framers of that horoscope used the system of tropical celestial longitudes which has been for a long time current in Europe but which, so far as is known, has never been adopted in this country, and in fact could not have been adopted here at any time, since the Indian astronomers, before Bhāskara's time (twelfth century A.D.) either were ignorant of, or misunderstood, the precise effect of precession (see WHITNEY and BURGESS' *Sūrya siddhānta*—1865). The Hindus no doubt used a tropical year until about A.D. 532, but they imagined that it was, or was bound to be, of the same length as the sidereal year, and they reckoned celestial longitudes, not from the First Point of Aries which is a point created by, and for, spherical astronomy, but from a fixed constellation in the heavens, which was *Kṛittikā* long before A.D. 532, and *Aśvinī* since that year.

291. It is possible that Bentley thought that for Rāma's epoch the celestial longitudes of heavenly bodies would be the same, whether reckoned, by the tropical system from the European First Point of Aries, or from Krittika by the

sidereal system, because the interval between the First Point of Aries of 961 B.C. and that of A.D. 532 is 24·5 degrees and the interval between the commencement of Kṛittikā and the commencement of Asvinī is 26°·40′, a difference of only 2 degrees and ten minutes. But our complaint against Bentley's horoscope is not merely that his positions are reckoned from Kṛittikā or from the First Point of Aries, but that they do not yield the particular rāśis or constellations indicated in Rāma's horoscope. The reader should remember that when a European astronomer speaks of the *sign Cancer*, for instance, he does not mean the *constellation* called Cancer or Karkaṭaka which is composed of certain fixed stars called *α Cancri*, *β Cancri* and so forth, but merely a part of the ecliptic removed by 90° to 119° from the point which happens at that particular epoch to be the First Point of Aries or the meeting point of the ecliptic and the equator. Some confusion necessarily underlies this mode of speech of European astronomers and in order to obviate it, they use the expression *sign* or *sign of the zodiac* when they mean a division of the ecliptic with reference to the moveable First Point of Aries; and the expression *constellation* or *constellation of the zodiac* when they mean a particular group of fixed stars. In Indian usage, whether astronomic or popular, there has never been any distinction between a *sign of the zodiac* and a *constellation of the zodiac*, and a horoscope gives the position of a planet located in a particular group of fixed stars, or somewhere near it, whereas in European astronomy the sign *Pisces* with reference to 2500 B.C., for instance, means an arc of 30° in the ecliptic, actually occupied in part by the *constellation* Aries (Mēsha) and in part by the *constellation* Taurus (Ṛishabha) and therefore 50 degrees distant from the *constellation Pisces* or *Mīna*.

292. We have not quite done with our criticism of Bentley's version of Rāma's horoscope. If we compare again the Ephemeris version of Rāma's horoscope in paragraph 285 supra, where we assumed the horoscope to be one of the year 964 B.C., and Bentley's version, read in terms of Indian sidereal longitude (vide paragraph 289 supra), we shall see that the advance in Jupiter's position from 964 B.C. (according to the Ephemeris) to 961 B.C. (Bentley, after allowing for precession) is 56 degrees and the advance of Saturn from the former to the latter year is 22 degrees. Now these advances are the advances of Jupiter and Saturn respectively for two years and not for three years, and we may suspect that Bentley's positions belong to 962 B.C. or A.D. 0 *minus* 961, not to 961 B.C. or A.D. 0 *minus* 960. In fact if we determine the positions of the planets in 962 B.C. according to Tables V-A and V-B of the Ephemeris, we shall find them to be as follows:—

B.C. 962; 31 complete days of the Indian solar year, when the moon had reached the 9th tithi—

English date.		Sun.	Mars.	Jupiter.	Venus.	Saturn.
6th April B.C. 962	...	30°	324·6°	152·9°	356·0°	215·0°

These positions are in every case, within 2° of Bentley's positions—vide paragraph 289 supra. We may conclude that Bentley, when referring to B.C. 961, really meant B.C. 962 and ought to have said—as astronomers do in such cases—"A.D. *minus* 961"; and that the positions of his planets as given by him, are *tropical* not *sidereal*.

293. We may now resume the consideration of Rāma's horoscope. Having failed (vide paragraph 285) to locate it in its entirety in 964 B.C., and having satisfied ourselves that Bentley's identification, referring really to 962 B.C., is not such as to satisfy the conditions of an Indian horoscope, we may still wish to ascertain whether there is any year within the traditional period of Indian history (we shall have something to say later, vide paragraph 300, as to the limits of the traditional period itself) when Vālmīki's horoscope would have been a true horoscope for a child born in that year, whether that child was Rāma or any other. This is a legitimate curiosity, and considering the interest which must always attach to any legitimate search for Rāma's horoscope, and so long as we are in a position to indulge it, historical considerations may for the moment be held in abeyance.

294. The general procedure is that indicated in paragraph 250 supra. Failing 964 B.C., we may wish to search in a remoter past, but Table V-A gives a list of

B.C. years only up to 1024 B.C. If we want to go further back, all we have to do is to select for our fixed year, 1501 B.C., 2501 B.C. or 3102 B.C. (the year 0 of Kaliyuga). If we propound to ourselves the problem, what year or years since 3102 B.C. up to date satisfied Rama's horoscope, we might divide the problem into two parts: (1) what years between 3102 B.C. and 1101 B.C. satisfied the conditions; and (2) what years between 1101 B.C. and A.D. 900 satisfied the conditions.

In this way our operations will be throughout additive and we shall avoid the inconvenience of subtraction or the algebraic addition of minus quantities; vide paragraph 257 supra.

For the first part of the problem we have to start as follows with 3102 B.C. as our fixed year.

3102 B.C. (Tables IV and IV-A).	Mars.	Jupiter.	Saturn.
Mean longitude on 0 day of solar year.	347·0°	15·7°	339·2°
Add for mean motion for 10 days of solar year	5·2°	0·8°	0·3°
	352·2°	16·5°	339·5°
In nearest whole degrees	352°	17°	340°
Actual geocentric places of which we are in search	270° to 299°	90° to 119°	180° to 209°
Corresponding mean positions (by Eye-Table) as before (paragraph 282) ...	240° to 270°	97° to 127°	175° to 205°
Wanted increase to mean longitude of year 3102 B.C., 10th solar day, of ...	+248° to +278°	+80° to +110°	+200° to +230°

1	2	3	4	5	6	7	8	9	10	11	12
Calculation for day of solar year.	Years from 3102 B.C.	Mars.	Jup.	Sat.	B.C.	A.D.	Day of solar year.	Mars.	Jup.	Venus.	Sat.
Eye-tab. 1, 0, d.		(Increases of longitude by Table V-A.)			(3102 *minus* yr. in Col. 2.)		(Col. 1.)	(See explanation in paragraph 296.)			
3001 B.C. 24·27	193	221	97	198	2909	−2908	24	4277 yrs.	4318 yrs.	4270 yrs.	4272 yrs.
93 years 20·64								−2908 „	−2908 „	−2908 „	−2908 „
9 tithis 8·86											
53·77								A.D. 1369	A.D. 1410	A.D. 1362	A.D. 1364
29·53								+363	+344	+478	+383
24·24								1762	A.D. 1754	A.D. 1840	A.D. 1747
								231°	**107°**	*1·2°*	**183°**
2801 B.C. 1·66	370	258	69	201	2732	−2731	27	4277 yrs.	4318 yrs.	4270 yrs.	4272 yrs.
69 years 16·27								−2731 „	−2731 „	−2731 „	−2731 „
9 tithis 8·86											
26·79								A.D. 1546	A.D. 1587	A.D. 1539	A.D. 1541
								+363	+344	+235	+383
								A.D. 1909	A.D. 1931	A.D. 1774	A.D. 1924
								295°	*82°* (*a*)	**344°**	**185°**
2501 B.C. 12·05	667	227	82	230	2435	−2434	10	4277 yrs.	4318 yrs.	4270 yrs.	4272 yrs.
66 years 19·42								−2434 „	−2434 „	−2434 „	−2434 „
9 tithis 8·86											
40·32								A.D. 1843	A.D. 1884	A.D. 1836	A.D. 1838
29·53								*240°*	**94°** (*a*)	*53·5°*	*215°* (*d*)
10·79											
2101 B.C. 25·89	1047	241	94	193	2055	−2054	6	3551 yrs.	3369 yrs.	3557 yrs.	5300 yrs.
46 years 1·00								−2054 „	−2054 „	−2054 „	−2546 „
9 tithis 8·86											
35·75								A.D. 1497	A.D. 1315	A.D. 1503	A.D. 1452
29·53								+363	+605	+470	+383
6·22								A.D. 1860	A.D. 1920	A.D. 1973	A.D. 1835
								260° (*b*)	**104°** (*c*)	**7°** (*e*)	**179°** (*f*)

(*a*) Jupiter's place was less advanced at the time by Sūrya siddhānta than by Ephemeris.
(*b*) Mars at the time was +9° by Sūrya siddhānta.
(*c*) Jupiter was 11° less advanced at the time by Sūrya siddhānta.
(*d*) Saturn at the time was 15° in advance by Sūrya siddhānta.
(*e*) If we allow 25° less for Venus' mean longitude, its actual place was by eye-table, **358·0°** by Sūrya siddhānta.
(*f*) Saturn was at the time 10 degrees in advance of this by Sūrya siddhānta.

1	2	3	4	5	6	7	8	9	10	11	12
Calculation for day of solar year.	Years from 3102 B.C.	Mars.	Jup.	Sat.	B.C.	A.D.	Day of solar year.	Mars.	Jup.	Ven.	Sat.
Eye-tab. **1, o, d**.		(Increases of longitude by Table V-A.)			(3102 *minus* yr. in Col. 2).		(Col. 1.)	(See explanation in paragraph 296.)			
1901 B.C.	3·29	1284	244	86	209	1818	−1817	24	3551 yrs.	3369 yrs.	3557 yrs.	3506 yrs.
83 years	11·44								−1817 „	−1817 „	−1817 „	−1817 „
9 tithis	8·86											
	23·59								A.D. 1734	A.D. 1552	A.D. 1740	A.D. 1689
										344	235	...
										A.D. 1896	1975	
									274°	97°	*64°*	194°
1201 B.C.	27·52	1961	226	111	202	1141	−1140	3	2178 yrs.	2159 yrs.	2139 yrs.	2298 yrs.
60 years	25·70								−1140 „	−1140 „	−1140 „	−1140 „
9 tithis	8·86											
	62·08								A.D. 1038	A.D. 1019	A.D. 999	A.D. 1158
	59·06								+726	+949	+948	+766
	3·02								A.D. 1764	A.D. 1968	A.D. 1947	A.D. 1924
									237°	121° (a)	327°	187°
1201 B.C.	27·52	1901	261	90	188	1201	−1200	7	2178 yrs.	2159 yrs.	2139 yrs.	2298 yrs.
9 tithis	8·86								−1200 „	−1200 „	−1200 „	−1200 „
	36·38								A.D. 978	A.D. 959	A.D. 939	A.D. 1098
	29·53								+726	+949	+948	+766
	6·85								A.D. 1704	A.D. 1908	A.D. 1887	A.D. 1864
									285°	100°	*38°*	173°

For the second part of the problem we start with 1101 B.C.

	Mars.	Jup.	Sat.
1101 B.C. 0 day, mean long.	309°	261°	310°
10 days ...	5·2°	0·8°	0·3°
	314°	262°	310°
Wanted	270° to 299°	90° to 119°	180° to 209°
Wanted corresponding mean positions (Eye-table)	240° to 270°	97° to 127°	175° to 205°
Increases sought. ...	+285° to 315°	+195° to +225°	+225° to 255°

1	2	3	4	5	6	7	8	9	10	11	12
Calculation for day of solar year.	Years from 1101 B.C.	Mars.	Jup.	Sat.	B.C.	A.D.	Day of solar year.	Mars.	Jup.	Ven.	Sat.
Eye-tab. **1, o, d.**		(Increases of longitude by Table V-A.)			(1101 *minus* yr. in Col. 2.)		(Col. 1.)	(See explanation in paragraph 296.)			
1001 B.C.	4·91	137	302	198	234	964	−963	24	2178 yrs.	2159 yrs.	2139 yrs.	2298 yrs.
37 years	10·43								−963 „	−963 „	−963 „	−963 „
9 tithis	8·86											
	24·20								A.D. 1215	A.D. 1196	A.D. 1176	A.D. 1335
									+726	+688	+705	+383
									A.D. 1941	A.D. 1884	A.D. 1881	A.D. 1718
									298°	*94°* (b)	*121°* (c)	188°
801 B.C.	11·84	374	305	190	250	727	−726	12	A.D. 1736	A.D. 1777	A.D. 1883	A.D. 1955
74 years	20·87											
9 tithis	8·86								296°	*85°*	332°	206°
	41·57											
	29·53											
	12·04											

(a) Jupiter at the time was 7° less by Sūrya siddhānta than by Ephemeris.
(b) Jupiter's place at the time was 6° less by Sūrya siddhānta than by Ephemeris.
(c) Venus' place at the time, by Sūrya siddhānta, was 53°, i.e., in Rishabha rāśi, not in Mīna.

1 Calculation for day of solar year.		2 Years from 1101 B.C.	3 Mars.	4 Jup.	5 Sat.	6 B.C.	7 A.D.	8 Day of solar year.	9 Mars.	10 Jup.	11 Ven.	12 Sat.
Eye-tab. **l, o, d.**			(Increases of longitude by Table V-A.)			(1101 *minus* yr. in Col. 2.)		(Col. 1.)	(See explanation in paragraph 296.)			
301 B.C.	29·14	814	284	223	226	287	−286	4	A.D. 1813	A.D. 1873	A.D. 1845	A.D. 1927
14 years	24·70											
9 tithis	8·86								**265°** (*a*)	**118°**	**356°**	**178°** (*b*)
	62·70											
	59·06											
	3·64											
201 B.C.	3·07	991	322	195	229	110	−109	26	A.D. 1706	A.D. 1706	A.D. 1787	A.D. 1806
91 years	12·89								*317°*	*90°* (*c*)	**344°**	**184°**
9 tithis	8·86											
	25·82											
101 B.C.	0·5	1051	287	215	242	50	− 49	21	A.D. 1766	A.D. 1766	A.D. 1847	A.D. 1866
51 years	5·6								**279°**	**109°**	*53°*	**197°**
9 tithis	8·8											
	20·9						A.D. +					
100 A.D.	13·5	1288	290	207	258	...	188	9	A.D. 1640	A.D. 1742	A.D. 1849	A.D. 1720
88 years	16·0								**276°**	**102°**	*40°*	*212°* (*b*)
9 tithis	8·9											
	38·4											
	29·5											
	8·9											
See Table II	5	1668	304	219	221	...	568	5	A.D. 1657	A.D. 1778	A.D. 1994	A.D. 1717
									287·4°	**114°**	*27°*	**177°** (*d*)
See Table II	21	1905	307	212	237	...	805	21	A.D. 1894	A.D. 1754	A.D. 1988	A.D. 1954
									300°	**107°**	*62°*	**192°**

295. The two tables set out above contain the results of an exhaustive search for Rāma's horoscope, extending over a period of 4,000 years from 3102 B.C., the year 0 of Kaliyuga, to A.D. 900. Apart from the opportunity which they afford us of substantiating the claim advanced in paragraph 257 supra, viz., that by means of Tables V-A and V-B it is possible to review the geocentric places of 5 planets during a period of 4,000 years, our present investigation table may be made to serve a quasi-historic purpose. (1) The framer of Rāma's horoscope may have had in view not an actual year or an actual horoscope, but only an ideal horoscope in which five planets occupied exalted positions. If so, the search for a year in which the five planets actually occupied such positions ranks no higher than as an astronomical pastime and is in no sense an historical problem. (2) For the reasons stated in paragraphs 245 and 280 supra, we must, as serious critics, dismiss the supposition that Rāma's horoscope was actually calculated at the time of his birth and that, in the absence of writing, the details of that horoscope were preserved by tradition from Rāma's epoch down to the time when the horoscope was inserted in Vālmīki's Rāmāyaṇa. (3) It remains to consider a third alternative, viz., that somebody, during the period when a study of planetary astrology was possible in India, viz., the period since about A.D. 300, actually noticed a year when the five planets occupied exalted positions, and framed Rāma's horoscope in imitation of that actual horoscope. If the year, or one of the years, when the five planets occupied exalted positions was comprised in what we may designate the astrological period, i.e., the period since A.D. 300 and if it also was a year in which it was possible for Rāma's horoscope to be interpolated or inserted in the Rāmāyaṇa, then the investigation will have served the quasi-historical purpose of indicating the probable time when this interesting interpolation in the text of the Rāmāyaṇa was carried out.

296. Now which of these alternatives does the investigation we have just concluded serve to establish? By its means we satisfied ourselves, in the first place, that there were only 15 years since 3102 B.C. when the 5 planets, Sun, Mars, Jupiter, Venus and Saturn were so placed that they *could* reach exalted positions in the month of Mēsha. These years are 2909, 2732, 2435, 2055, 1818, 1201, 1141, 964, 727, 287, 110, 50 B.C. and A.D. 188, 568 and 805. We next calculated, in

(*a*) Mars at the time was 6 to 5° in advance of this by Sūrya siddhānta; it is, therefore, regarded as a suitable position.
(*b*) Saturn at the time was 6° more advanced by Sūrya siddhānta than by Ephemeris.
(*c*) Jupiter's place at the time 3° less by Sūrya siddhānta than by Ephemeris.
(*d*) Saturn at the time stood 3·2 degrees further by Sūrya siddhānta than by Ephemeris.

column 1 of the table, on what day of the Indian solar year, the mean tithi śukla navamī in Mēsha month actually fell in each of these years. We did not calculate the actual ending moment of the tithi, because that would affect our result only to the extent of half-a-day (paragraph 28 *supra*). Nor did we calculate the equivalent English date in each case, as this is a detail which can easily be supplied from Eye-table **k** and **n** when we know the year.

As a third step, we filled up columns 9 to 12 of our investigation table, first, with the year in the current cycle of each planet when it attained the same position as in the year entered in columns 6 and 7. By "current cycle" we of course mean the cycles of years, 383, 363, 355, 344 and 235 for which the actual geocentric places of the five planets Saturn, Mars, Mercury, Jupiter and Venus respectively for every tenth day are furnished in Table V-B. Table V-A enables us to fill up columns 9 to 12 of our investigation table from the year 1024 B.C. to the year A.D. 2005. For years before 1024 B.C. we use, in filling up columns 9 to 12, the major cycles given at the beginning of Table V-A in combination with the by-now familiar cycles of 363, 344, 235 and 383 cycles for Mars, Jupiter, Venus and Saturn, respectively. Lastly in columns 9 to 12, we noted any suitable results reached by us by means of heavy type numerals, and unsuitable results by means of italic numerals.

297. The geocentric places thus arrived at are correct astronomical places, with, in any case, a probable error not exceeding a degree either way. But we have also to bear in mind that the mean places assumed in Indian astronomy for the different planets at the epoch 0 Kaliyuga were not the correct places by modern astronomy, which it is the object of the Ephemeris to reproduce, but a mean longitude of 0 degree *in every case* (*Sūrya siddhānta* I. 57). As the centuries advanced from 0 Kaliyuga, the differences between Sūrya siddhānta without *bīja* and modern astronomy underwent variations which are tabulated below ; and by A.D. 900 there was practically no difference between the mean places of planets by Sūrya siddhānta (without *bīja*) and those deduced by modern astronomy. Since A.D. 900 differences have accumulated again, and this is the period when *bījas* or corrections were introduced by Indian astronomers to bring the planetary positions, as calculated by them, into accord with actual observation (see paragraph 268 *supra*).

The following quantities, extracted from Table IV-B, have to be added, or subtracted (as the case may be), in order to obtain Sūrya siddhānta mean positions of planets at different epochs from the standard positions deduced from the Ephemeris Tables V-A and V-B :—

B.C.		Mars.	Jupiter.	Saturn.	Venus.	Mercury.
3101	...	+ 11·9	− 15·9	+ 20·7	− 33·0	+ 33·0
2101	...	+ 9·2	− 11·7	+ 15·7	− 24·9	+ 28·9
1101	...	+ 6·6	− 7·5	+ 10·7	− 16·7	+ 24·7
101	...	+ 4·0	− 3·2	+ 5·7	− 8·6	+ 20·5
A.D.						
900	...	+ 1·3	+ 1·0	+ 0·7	− 0·4	+ 16·3
1900	...	− 1·3	+ 5·2	− 4·3	+ 7·7	+ 12·1

298. At a first glance, and judged by Indian Ephemeris figures, without correction for Sūrya siddhānta, none of the 15 possible years since 3102 B.C. could have yielded a horoscope satisfying all the conditions of Rāma's horoscope. In ten years, 2909. 2435, 2055, 1818, 1201, 964, 50 B.C , and A.D. 188, 568, and 805, Venus was not in Mīna, but in Mēsha or Ṛishabha, and in one case in Mithuna. [In one of these years 2055 B.C., which was otherwise suitable, Venus was only 7° beyond Mīna, and this is a case which we shall have to re-consider later, first because if we make the correction for Venus' mean longitude according to Sūrya siddhānta suitable for the epoch, viz.,—25° as compared with Ephemeris, we shall find that by the Eye-table for Venus the actual geocentric place of Venus at the end of six days of the Indian solar year in 2055 B.C. must have been 358·0° which was in Mīna rāśi as required by Rāma's horoscope ; and secondly, because Mars' position on the same day by Sūrya siddhānta, was 260·6° (the position by Ephemeris) + 9·2 = 269·8°, which is within a few minutes of Makara rāśi (270°), the position required by Rāma's horoscope.]

Mars.—In three of the 15 years entered in our investigation tables, viz., 2909, 2435, 1141 B.C., Mars was so far short of Makara that even the addition required by Sūrya siddhānta would not make up for the deficiency. In two years, 2055 B.C.

(already adverted to in the last sub-paragraph) and 287 B.C., Mars' position was 260·6° and 265° respectively by Ephemeris, but by Sūrya siddhānta it would have been 269·8° and 270° respectively, which would satisfy Rāma's horoscope. We shall, therefore, have to review these two years separately, as the other planets then occupied suitable positions.

299. *Jupiter.*—In two of the 15 possible years 2732 B.C. and 727 B.C., Jupiter's position by the Ephemeris was 82° and 85° respectively. In the case of Jupiter, the conversion from Ephemeris to Sūrya siddhānta positions at the epoch in question requires a *deduction*, not an *addition*: if we make the appropriate deduction, we shall find that Jupiter's actual geocentric place on *śukla navami* in Mēsha month in 2732 B.C. was 68° while his place on the same tithi in 727 B.C. was 79°. Neither of these positions suits Rāma's horoscope.

Saturn.—In two of the fifteen possible years, viz., 2435 B.C. and A.D. 100, which are equally unsuitable for Venus, the position of Saturn by the Ephemeris was in excess of that required by Rāma's horoscope, and by Sūrya siddhānta, Saturn's position in those years would have been still more in excess. In two other years, 2055 B.C. and 287 B.C., Saturn's position by the Ephemeris was 179 and 178 degrees respectively, but by Sūrya siddhānta, he would have attained 194° and 184° respectively which would satisfy Rāma's horoscope.

300. To enable the eye to take in rapidly the results of each year investigated on pages 118, 119, the position of any planet suitable for Rāma's horoscope is indicated in heavy arabic numerals and the reverse in italic numerals. Reviewing the fifteen years' tabulated results as a whole, we find that by Sūrya siddhānta the conditions of Rāma's horoscope would have been fully satisfied in two years, 2055 B.C. and 287 B.C. The positions were, by Sūrya siddhānta,

	Sun.	Mars.	Jupiter.	Venus.	Saturn.
2055 B.C.	7°	270°	93°	358°	194°
287 B.C.	5°	270°	114°	356° [or somewhat less, but still in Mīna]	184°
Rāśi and house of exaltation for each planet.	Mēsha.	Makara.	Karkaṭaka.	Mīna.	Tulā.

To what extent historical or literary criticism will be able to turn to account these two dates for Rāma's horoscope is a speculation on which it would be foreign to our purpose to enter at present. We set out in paragraph 294 with the single proposition, namely, to try and discover the year or years between 3102 B.C. and A.D. 900, which would satisfy Rāma's horoscope and we have reached two astronomically correct solutions of this problem, understanding, of course, by astronomy the Indian science, and more particularly, the system of the Sūrya siddhānta without *bīja*. 2055 B.C. may be considered too remote for any historical or quasi-historical speculation. 287 B.C. was about the epoch when the Ramāyaṇa epic was in process of evolution and construction, but data are as yet wanting to enable us to affirm that Indian astronomers of that time had the knowledge requisite for the construction of a horoscope like Rāma's.

301. We may note in passing that the last of the possible years in our investigation table, viz., A.D. 805 is a year which satisfies Śankara's horoscope. It fails altogether to give a position for Venus that would satisfy Rāma's horoscope, but Venus was not in exaltation in Śankara's horoscope in which only the four remaining planets Sun, Mars, Jupiter and Saturn were in exaltation. It has been sometimes assumed that A.D. 805 is the only year that satisfies Śankara's horoscope; but we may note that not only A.D. 805 but also A.D. 568, 50 B.C. and 287 B.C. satisfy Śankara's horoscope. In *Ind. Antiq.*, Vol. XIII (Ap. 1884), Mr. K. T. Telang wrote as follows: "I am content to accept the beginning of the seventh century A.D. as a period down to which we can trace Pūrṇavarma as reigning in Magadha and that is about the time, therefore, when Sankarachārya must have composed his great *Śārīraka Bhāshya*."

302. Incidentally we may note that the year 964 B.C. which is one of 15 possible years for Rāma's horoscope, and not a particularly good one either (because it shares with other years in the series the defect of an unsuitable position for Venus—vide paragraph 285 *supra*), is marred by another serious defect, viz., a position for Jupiter (94·4°) which though one of exaltation (i.e., in Karkaṭaka rāśi) by the Ephemeris, is not so by Sūrya siddhānta, because at the epoch in

question, according to the small table in paragraph 297 *supra*, the position of Jupiter by Sūrya siddhānta without *bīja* was 7 degrees less than by the Ephemeris ; in other words, the position of Jupiter by Sūrya siddhānta on *śukla navamī* tithi in Mēsha month in the year 964 B.C. was 94·4° *less* 7°, or 87·4° which would have been 3 degrees short of Karkaṭaka. Considering the importance of Jupiter in an Indian horoscope, let alone Rāma's in whose horoscope it is all in all, we must finally discard 964 B.C. as being an impossible year for Rāma's horoscope.

303. Tables V-A and V-B, being based on the constants of modern astronomy, will be found serviceable in verifying statements occurring in any literature, ancient or modern, regarding the positions of planets. We read, at page 4 of LOCKYER's *Star-gazing*, of a Chinese observation of the conjunction of 5 (*sic*) planets between 2514 and 2436 B.C. The same occasion is apparently referred to in CHAMBERS' *Sun, Planets and Comets*, where we read : "The earliest record we possess of an occurrence of this kind is for China. A conjunction of Mars, Jupiter, Saturn and Mercury in the constellation of *Shi* was assumed as an epoch by the Emperor Chuen-hio and it has been found by Messrs. Desvignoles and Kirch that such a conjunction actually took place on 18 February 2446 B.C. between 10° and 18° of Pisces. De Mailla fixes 9 February 2441 B.C. as the date of the conjunction and says that the four planets, with the moon, were comprised within an arc of 12° extending from 15° to 27° of Pisces.

De Mailla gives the following positions :—

Mercury, R.A....	344° 56′ 16″	Saturn	354° 39′ 47″
Jupiter ...	347° 2′ 12″	Mars	356° 45′ 11″ ”
Moon ...	353° 18′ 21″		

304. In the first place it is not possible that both Desvignoles and De Mailla can be correct, since between 18 February 2446 B.C. and 9 February 2441 B.C. Jupiter must have moved 150° or 5 signs and Saturn 60° or 2 signs. In the second place, it is easy to satisfy ourselves, with the aid of tables V-A and V-B, that neither of the above dates is correct. But before doing so, we should observe, as we did in paragraph 289 *supra*, that in European astronomy longitudes are reckoned from the First Point of Aries. In this case we may assume De Mailla's positions in R.A. (Right Ascension) to be tropical longitudes, and convert them into Indian sidereal longitudes by adding to each position 49°, which was the distance from the First Point of Aries in 2500 B.C. to the 0 degree of the sun's mean longitude in the same year in the Indian ecliptic. We then have the following as De Mailla's positions for 9th February 2441 B.C., expressed in terms of Indian sidereal longitude :—

Mars 46° (rounding off fractions of a degree) ; Mercury 34° ; Jupiter 36° ; Saturn 44° ; Moon 42°.

In 2441 B.C. the Indian solar year began on February 21, because in 2501 B.C., the Indian solar year began on Feb. 21·09 (Eye-table, section **k**)
and for 60 years from 2441 B.C. we add ... ·52 (Eye-table, section **n**).

Feb. 21·61

Therefore 9 February in 2441 B.C. was about 12 days before the commencement of the Indian solar year. Consequently at the commencement of the solar year 2441 B.C., Mars would be about 6 degrees further than on 9 February and Mercury about 12 degrees further, while Jupiter and Saturn would be very much in the same position. We can, therefore, apply a preliminary test by calculating, with the help of tables V-A and V-B, the positions of the 4 planets on 0 day of the Indian solar year 2441 B.C. Applying the large cycles found at the beginning of table V-A, we have, for the positions of the planets on 0 day of Indian solar year 2441 B.C.,—

	Mars.	Mercury.	Jupiter.	Saturn.
	4277 yrs.	4306 yrs.	4318 yrs.	4272 yrs.
	— 2440 ,,	— 2440 ,,	— 2440 ,,	— 2440 ,,
	A.D. 1837	A.D. 1866	A.D. 1878	A.D. 1832
(Table V-B)	110°	9°	282°	140°
353rd day of previous year or 9 February 2441 B.C. ...	104°	0°	281	139°

305. Evidently, there was no conjunction of the four planets in question, or of even of two of them, on 9 February 2441 B.C., and there must be a mistake somewhere. Using the indications furnished by De Mailla's positions for Mercury and the moon, we may conjecture that the date he had in mind was somewhere about 2 March 2449 B.C., or the 10th day of the Indian solar year, 2449 B.C. For, applying the same major cycles as before, we have, for 10th day of 2449 B.C.,—

	Mars.	Mercury.	Jupiter.	Saturn.
	4277 yrs.	4306 yrs.	4318 yrs.	4272 yrs.
	— 2448 „	— 2448 „	— 2448 „	— 2448 „
	A.D. 1829	A.D. 1858	A.D. 1870	A.D. 1824
10th day of 2449 B.C. (2 March 2449 B.C.) ...	46°	28°	32°	34°
Cf. De Mailla's positions (converted into Indian sidereal longitudes) paragraph 304 ...	46°	34°	36°	44°

For the moon's position on the same day, we proceed as follows:—

(Eye-table, section **k, l, n, o**.) 2501 B.C., commencement of Indian solar year, Feb. 21·09, 1st N.M. in S. year 12·05

52 years ... ·45 — 24·24

Feb. 21·54 — 36·29

— 29·53

6·76

Mean ending moment of 3rd tithi 9·71 — Add 3 tithis 2·95

Feb. 31·25 = Mar. 2. — 9·71

March 2, 2449 B.C. was the day on which the 3rd tithi came to an end. The sun's longitude on the day in question being nearly 10 degrees, the moon's longitude at the mean ending moment of the tithi must have been $10 + 3 \times 12 = 46°$. De Mailla's longitude for the moon is 42°, which must have been attained about 6 to 8 hours on either side of the end of the 3rd mean tithi. We see therefore that the date which De Mailla had in mind must have been 2 March, 2449 B.C. There is also probably an error of 10° in his position for Saturn. None of the planets was in the constellation Pisces but all were in Rishabha, a part of which probably corresponds to the Chinese constellation Shi (= Indian Krittika).

306. For another example of planetary conjunctions we select the following from CHAMBERS' *Sun, Planets and Comets*:—

"On September 15, A.D. 1186, Mercury, Venus, Mars, Jupiter and Saturn were in conjunction between the Wheat-ear of Virgo (Spica Virginis) and Libra."

Here is an unmistakable reference to a constellation (not a tropical sign) of the zodiac and we ought to be able to verify it easily. The 15 September A.D. 1186 was the 174th day of the Indian solar year A.D. 1186.

We take out the positions of the planets on that day from tables V-A and V-B.

	Mars.	Mercury.	Jupiter.	Venus.	Saturn.
(Table V-A) A.D. 1186 =	A.D. 1912	A.D. 1896	A.D. 1791	A.D. 1899	A.D. 1952
(Table V-B) 174th day	177°	176°	169°	170°	174°

The planets were, we find, comprised within an arc of 8 degrees in the constellation Kanyā or Virgo. In this position, however, they were not visible to the naked eye since the longitude of the sun was 167°. The 14 September 1186 was, as we may see from the Ephemeris for that date (Vol. III of the present work), a day of new moon, and on the 29th of that month there was a lunar eclipse. We know also from the *Encyclopædia Britannica* (11th edition, Volume 2, page 799) that the end of the world was imminently expected in 1186 A.D., and predicted by astrologers all over Europe, apparently on account of this extraordinary conjunction, the like of which perhaps has not occurred since man began to observe the stars.

307. Mention of the year A.D. 1186 leads us to another conjunction of the same kind which must have happened in 2588 B.C., on the 175th day of the Indian solar year (about 14th August). There is no record of this conjunction

anywhere; but that it must have occurred on the date in question may be inferred from Table V-A and Table V-B. In fact after 3,773 years (a compound of 2,005 and 1,768 years) the mean longitudes of Mars, Jupiter and Saturn must according to Table V-A, increase by 11, 20 and 22 degrees, respectively. The reader should find no difficulty in making the necessary calculations.

	Mars.	Mercury.	Jupiter.	Venus.	Saturn.	Sun.
	4277 yrs.	4306 yrs.	4318 yrs.	4270 yrs.	4272 yrs.	(Table
	— 2587	— 2587	— 2587	— 2587	— 2587	IV-C.)
	A.D. 1690	A.D. 1719	A.D. 1731	A.D. 1683	A.D. 1685	
				+ 235		
				= A.D. 1918		
175th day, 2588 B.C.	172°	160°	154°	155°	155°	167°

The sun was 13° to the east of Jupiter, Venus and Saturn and these planets must have been visible shortly before sunrise. The moon was in a different constellation. With these positions we may compare the places of the five planets on 30th Oct. A.D. 1921 (the current year) which was also a day of new moon, or better still, one week earlier on 23 Oct. A.D. 1921 when Jupiter, Saturn and Venus were in close proximity to each other and Mars only 10 degrees off.

308. The reader will find it a useful exercise to verify the following conjunctions, also extracted from CHAMBERS' *Sun, Planets and Comets* :—

"On November 11, A.D. 1544, Venus, Jupiter, Mars and Saturn were very close, and Mercury was only 16° distant . . . On 11 November A.D. 1544, Venus, Jupiter, Mercury and Saturn were enclosed in a space of 10°. . . On March 17, A.D. 1725, Venus, Jupiter, Mars and Mercury appeared together in the same field of the telescope . . . On December 23, A.D. 1769, Venus, Jupiter and Mars were very close. On October 3, A.D. 1801, Venus, Jupiter and Moon were very close in Leo and Saturn not far off." (For the last two dates the positions of all 5 planets are given *in situ* in Table V-B.)

309. We will conclude the present subject with an example which has an important bearing on Biblical chronology. We are told in the Encyclopædia Britannica (11th edition, Volume 2, page 888), art. *Bible—New Testament Chronology*, that the astronomer Kepler identified the star of the Magi with a conjunction of the planets Jupiter and Saturn which occurred, in the constellation Pisces in May, October and December of 7 B.C. The same work adds, in a footnote (*ibid.*) :—"It is a curious coincidence that a medieval Jew, R. Abarbanel (Abrabanel), records that a conjunction of these particular planets in this particular constellation was to be a sign of Messiah's coming. It is just conceivable that his statement may ultimately depend on some such ancient tradition as may have been known to Chaldaean Magi."

We can, with the help of tables V-A and V-B, trace the successive positions of Jupiter and Saturn which must have occupied in 7 B.C. the same positions as they did in 1809 and 1909 respectively. We may set down the positions in a table as follows :—

Movements of Jupiter and Saturn in 7 B.C. (Indian solar year).

Day of Indian solar year.	Julian date.	Jupiter.	Saturn.	Remarks.
0 Day.	March 14·43	343·4°	350·5°	Jupiter's movements in 7 B.C. were the same within a fraction of a degree as in A.D. 1809, and Saturn's movements the same as in A.D. 1909. Tables V-A and V-B. The cyclic variation in the case of Jupiter was that for 1809 + 6 = 1815 years = 3 cycles of 605 years each. The variation was ∴ 3 × — ·223° = — ·669°. The cyclic variation in the case of Saturn was that corresponding to 1909 + 6 = 1915 = 5 × 383 years; i.e., 5 × — ·095° = — ·475°.
10 ,,	March 24	345·8°	351·8°	
20 ,,	April 3	348·1°	353·0°	
30 ,,	April 13	350·3°	354·3°	
40 ,,	April 23	352·5	355·4	
50 ,,	May 3	354·5	356·4	
60 ,,	May 13	356·4	357·5	Distance between the sun and the planets 300° = 20 hrs. Jupiter and Saturn rise in the east 8 hrs. after sunset.

Day of Indian solar year.	Julian date		Jupiter.	Saturn.	Remarks.
70 Day.	May	23	358·1	358·2	Distance between sun and the planets 290°. Jupiter and Saturn rise in the east 7 hrs. after sunset.
80 ,,	June	2	*359·5*	*358·8*	
90 ,,	June	12	1·0	359·6	
100 ,,	June	22	1·3	359·7	
110 ,,	July	2	2·8	359·9	
120 ,,	July	12	2·3	0·1	
130 ,,	July	22	2·2	359·8	
140 ,,	August	1	2·1	359·4	
150 ,,	August	11	1·0	358·9	
160 ,,	August	21	0·0	358·2	
170 ,,	August	31	358·6	357·5	
180 ,,	September	10	*357·4*	*356·7*	Distance between sun and the planets 180°. Saturn and Jupiter rise in the east about the time of sunset.
190 ,,	September	20	356·7	355·9	
200 ,,	September	30	355·4	355·2	
210 ,,	October	10	353·7	354·3	
220 ,,	October	20	352·8	353·8	Distance between sun and the planets 135°. Saturn and Jupiter rise 9 hrs. before the sun, i.e., at 9 p.m.
230 ,,	October*	30	352·3	353·4	
240 ,,	November	9	359·0	352·8	Both Jupiter and Saturn are stationary for about a month.
250 ,,	November	19	352·1	352·9	
260 ,,	November	29	352·5	352·9	
270 ,,	December	9	353·3	352·9	Saturn still stationary. Distance between sun and the planets 90°. Saturn and Jupiter appear in zenith at sunset.
280 ,,	December	19	354·4	353·6	
290 ,,	December	29	*355·6*	*354·2*	At sunset Jupiter and Saturn appear in the western sky.
300 ,,	January	8	357·2	354·8	
310 ,,	January	18	359·0	355·8	
320 ,,	January	28	1·1	356·9	
330 ,,	February	7	3·1	358·0	
340 ,,	February	17	5·4	359·2	Mars on 344th day was in conjunction with Saturn.
350 ,,	February	27	7·6	0·4	
360 ,,	March	9	10·0	1·6	In March 6 B.C. both Jupiter and Saturn had conjunctions with the sun and disappeared and they must have reappeared about 4 April as morning stars in the east.

310. The above table shows that on the 70th solar day (May 23) Jupiter and Saturn were within a degree of each other in the last few degrees of Pisces. On the same day the distance between the sun and Jupiter *cum* Saturn was about 290° and the planets must have risen together in the east about seven hours after sunset. From this time the conjoined planets continued to rise night after night in the east until the 180th day (September 10) when they must have risen in the east just as the sun set in the west. On this date the longitude of Jupiter was 357·4 and of Saturn 356·7 and they must have been very close.

We read in St. Matthew, 2, 1-12. "Now when Jesus was born in Bethlehem of Judea in the days of Herod the King, behold, there came wise men from the east to Jerusalem, saying, Where is he that is born King of the Jews? for we have seen his star *in the east*, and are come to worship him. . . . Then Herod, when he had privily called the wise men, inquired of them diligently *what time* the star appeared. . . . When they had heard the king, they departed; and lo, the star which they saw in the east, *went before them and stood over where the young child was. When they saw the star, they rejoiced* with exceeding great joy . . . and when they came into the house, they saw the young child with Mary his Mother, and fell down and worshipped him," etc.

On 9 December 7 B.C., the distance between the sun and Jupiter *cum* Saturn was 90° and the two planets must at sunset have appeared in the zenith of the sky. As after this date they ceased to appear in the eastern sky at night, the conference of the Magi with Herod may have occurred about December 9, and they probably referred to their experience in May of the same year when they said that they had seen the star of the King of the Jews *in the east*.

On the 340th day of the Indian solar year 7 B.C., i.e., about 17 February 6 B.C., there was a further phenomenon, for on that day the longitudes of Mars, Saturn and Jupiter were 359·4°, 359·2° and 5·4°, respectively, so that now Mars and Saturn were in conjunction.

* Dr. Neugebauer (*op. cit.* page 95 *ante*) has calculated very accurately, according to modern astronomy, the geocentric longitudes of Jupiter and Saturn for Memphis (6 p.m.) on October 27, 7 B.C. His longitudes are, Jupiter, 345·16° and Saturn 345·77°. If to these figures we add the Indian precession for 539 years (page 94 ante), i.e., 8·5°, we get 353·66° for Jupiter and 354·27° for Saturn.

The Scripture narrative refers to a temporary disappearance of the star and to its reappearance at Bethlehem. We find from the table of movements that between the 0 and the 15th day of the Indian solar year 6 B.C., i.e., between March 14 and March 29 of that year, first Saturn and then Jupiter must have had a conjunction with the sun, that is, they temporarily disappeared, and about April 4, they were to the west of the sun, and they must have appeared low in the western sky, immediately after sunset. This may have been the reappearance at which the Magi rejoiced. Or the expression "the star *stood* over where the child was" may refer to the fact that Saturn became stationary for about two months from October 20, 7 B.C. till December 19 of the same year and that during the same period Jupiter came closer and closer to Saturn until they were again together on December 29. The appearance of the two planets blazing from the zenith after sunset on December 9 must have been a striking phenomenon, at which the Magi could well have wondered as the star "stood" (i.e., was stationary in the zenith for several days) "over where the child was." December 25 is the traditional day when Christ was born.

Kepler, from a study of these phenomena in the light of the tradition recorded by Abrabanel, came to the conclusion that Christ was probably born in 7 B.C. during a conjunction of Saturn and Jupiter. It is now well known that the chronology of St. Dionysius Exiguus who identified what we now call 1 B.C. (= the year 753 A.U.C. or of the Foundation of Rome) with the year of the birth of the Christ was wrong by at least three or four years, and that Christ must have been born before the year now spoken of as 4 B.C. (A U.C. 750).

311. Before concluding this chapter, it may be useful to indicate, for the benefit of other investigators, an important application, and one that is by no means self-evident, of the principle of cyclic recurrence in the positions of planets. In order to obtain the positions of planets in the current cycle, as is done in table V-B, for 363 years (Mars), 355 years (Mercury), 344 years (Jupiter), 235 years (Venus), and 383 years (Saturn), it is not necessary to calculate the positions of these planets for all these years. If we have the calculated positions of Mars for a series of 126 years, in all, say from A.D. 1822 to A.D. 1947, of Mercury for 79 years (say, from A.D. 1855 to A.D. 1933), of Jupiter for 95 years (say, from A.D. 1818 to A.D. 1912), of Venus for 48 years (see paragraph 313 below) and of Saturn for 88 years (say, from A.D. 1842 to A.D. 1929), we have sufficient material for fixing the positions of these planets in the first place for 363, 355, 344, 235 and 383 years, respectively, and secondly through tables V-A and V-B for all the time comprised in the range of history and tradition. The procedure is as follows.

312. Let us assume that we have the calculated positions of Mars for every tenth day in every year from A.D. 1822 to A.D. 1947. With the help of the positions in the first and last of these years as well as of the positions in two intermediate years 1869 and 1909, we obtain the positions in six other years as below :—

0 DAY. Position in A.D. 1947 *minus* ·1 degree		0 DAY. Position in A.D. 1869 *minus* ·1 degree	
= position in 1584 A.D. ...	337·6°	= position in A.D. 1506 ...	115·2°
1663 ...	338·3°	1585	116·5°
1742 ...	339·1°	1664	117·9°
1821 ...	339·8°	1743	119·2°
1900	340· 6°	1822 ...	120·5°
4) 3· 0°		4) 5·3°	
0·75°		1·3°	

We know that Mars' position on 0 day in A.D. 1584 must have been the same as his position 363 years later, i.e., on 0 day in A.D. 1947, less ·1 degree. We therefore write down as Mars' position in A.D. 1584, the position we have already calculated for 0 day in A.D. 1947, less ·1 degree, i.e., 337·6 degrees.

Similarly we write down as Mars' position on 0 day in A.D. 1506, his ascertained position on 0 day in A.D. 1869 less ·1 degree, i.e., 115·2 degrees.

Between A.D. 1584 and A.D. 1900 there are 316 years or 4 periods of 79 years each. We know from the table of Mars' cycles that in 79 years Mars' mean

longitude increases by + 1·015 degree. Our difficulty is, that owing to the annual equation and the anomaly, the actual geocentric place of Mars after 79 years may not increase by exactly + 1·015 degree, but by something more or something less. But for small increases of mean longitude the annual equation and the anomaly will operate uniformly, and we may assume, without risk of error, that if Mars' position on 0 day in A.D. 1584 was 337·6° and if his position on 0 day in A.D. 1900, was 340·6 degrees, his three intermediate stages, viz., those on 0 day in A.D. 1663, in A.D. 1742, and in A.D. 1821 may be obtained by applying a uniform increment of $\frac{3·0}{4} = 0·75$ degree. We obtain in this way the actual geocentric place of Mars on 0 day in the years A.D. 1663 (338·3°), 1742 A.D. (339·1°) and 1821 A.D. (339·8°), and we may, if we please, verify these figures by direct calculation.

It is obvious that for every ascertained position of Mars between A.D. 1822 and A.D. 1900, we shall be able to obtain his positions in three other years, in other words, by means of his ascertained positions in the 79 years A.D. 1822 to A.D. 1900, we shall be able to obtain the positions in $3 \times 79 = 237$ years; and since we have already ascertained the positions of Mars for 126 years, A.D. 1822 to A.D. 1947, we shall have on the whole the positions for $237 + 126 = 363$ years, the full number of years required for a Mars' cycle of 363 years.

313. The following table shows at a glance how cycles of 355, 344 and 383 years may be obtained for Mercury, Jupiter and Saturn respectively by following the method we have already indicated for Mars. (The figures refer of course to A.D. years) :—

Mars.		Mercury.		Jupiter.		Saturn.	
1947 = 1584	1869 = 1506	**1933** = 1578	1888 = 1533	**1912** = 1568	1830 = 1486	**1929** = 1546	1871 = 1488
1663	1585	1624	1579	1651	1569	1605	1547
1742	1664	1670	1625	1734	1652	1664	1606
1821	1743	1716	1661	1817	1735	1723	1665
1900	**1822**	1762	1717	1900	**1818**	1782	1724
		1808	1763			1841	1783
		1854	1809			1900	**1842**
		1900	**1855**				

The figures in heavy type are those indicated in paragraph 311 *supra*.

By means of the positions of Mercury, ascertained for the 46 years A.D. 1855 to A.D. 1900, we obtain positions for $46 \times 6 = 276$ years in addition to the ascertained positions for 79 years; total 355 years, which is Mercury's cycle.

By means of the positions of Jupiter, ascertained for the 83 years A.D. 1818 to A.D. 1900, we obtain positions for $83 \times 3 = 249$ years in addition to the ascertained positions for 95 years; total 344 years, which is Jupiter's cycle.

By means of the positions of Saturn, ascertained for the 59 years A.D. 1842 to A.D. 1900, we obtain positions for $59 \times 5 = 295$ years in addition to the ascertained positions for 88 years; total 383 years, which is Saturn's cycle.

314. For obtaining the figures for a Venus' cycle of 235 years we proceed by a slightly different method. We first of all calculate the positions of Venus for 48 years as follows :—

I	II	III	IV	V	VI	VII	VIII
1800	1801	1802	1803	1804	1805	1806	1807
1840	1841	1842	1843	1844	1845	1846	1847
1880	1881	1882	1883	1884	1885	1886	1887
1920	1921	1922	1923	1924	1925	1926	1927
1960	1961	1962	1963	1964	1965	1966	1967
2000	2001	2002	2003	2004	2005	2006	2007

To these six rows of eight figures each we can, without calculation, add a seventh row—

VI	VII	VIII	I	II	III	IV	V
2040	2041	2042	2035	2036	2037	2038	2039

For, the position of Venus in A.D. 2040 is the same as its position 235 years before, in 1805, which stands at the head of column VI. We therefore repeat for A.D. 2040 the figure already obtained for 1805. Similarly we repeat for 2041.....2039 the figures already obtained for 1806 . . . 1804.

315. (Venus—*contd.*) We next proceed to interpolate between 1800 and 2040 the figures for every eighth year as we did before for the other planets. Thus, supposing we want the figure for 0 day in each case we interpolate as follows :—

		0 DAY.				0 DAY.	
1800	...	...	329·3 (ascertained figure).	1888	...	335·4	(ascertained figure).
1808	...	329·8		1896	...	336·1	
1816	...	330·4		1904	...	336·8	
1824	...	331·0		1912	...	337·5	
1832	...	331·6		1920	...	... 338·2	(ascertained figure).
1840	...	... 332·2	(ascertained figure).			3·5 ÷ 5 = ·7	
		2·9 ÷ 5 = ·6		2000	...	... 344·0	(ascertained figure).
1848	...	332·7		2008	...	344·5	
1856	...	333·2		2016	...	345·0	
1864	...	333·7		2024	...	345·6	
1872	...	334·2		2032	...	346·1	
1880	...	... 334·7	(ascertained figure).	2040	...	... 346·6	(figure ascertained for A.D. 1805)
		2·5 ÷ 5 = ·5.					2·6 ÷ 5 = ·52.

From every year for which we possess ascertained figures we are thus able to obtain figures for four more years; out of 48 years' figures we can thus evolve figures for 192 years in addition to the original 48; total 240 years, which is five years more than the full Venus' cycle of 235 years.

316. The increase of mean longitude of Venus every 8 years is 1·52 degrees, and we could have interpolated all the figures between A.D. 1800 and A.D. 2040 in one series of thirty steps, thus

	0 DAY.	
A.D. 1800	...	329·3 (ascertained figure).
1808	... 329·9	
1816	... 330·5	
1824	... 331·0	
1832	... 331·6	
1840	... 332·2	
1848	... 332·7	
...	... ...	...
A.D. 2040	...	346·6 (figure ascertained for 1805)

30)17·3

·57

We see that the figures obtained in the last paragraph for

A.D.	1808	1816	1824	1832	1840	1848
are	329·9	330·5	331·0	331·6	332·2	332·7
against	329·8	330·4	331·0	331·6	332·2	332·7

which we obtained in paragraph 315 and the differences are hardly perceptible; nevertheless it is safe to proceed by breaking the thirty steps into a number of stages as we did in paragraph 315 because the successive differences in the anomaly and annual equation of the thirty steps caused by differences in mean longitude amounting in all to 17·3 degrees may not be uniform in the case of Venus.

317. In the following table, in which the base year is A.D. 1999, the above method of development of a perpetual planetary ephemeris from day today is illustrated in greater detail. The figures for the top and bottom line in the case of each planet being known, the examples show how the figures for intermediate years may be obtained by interpolation. If this table is extended to 79 years in the case of Mars, taking 1998, 1997 . . . 1921 as the successive base-years, to 46 years in the case of Mercury, to 83 years in the case of Jupiter, to 48 years in the case of Venus, and 59 years in the case of Saturn, we shall have all the material required for a perpetual planatery almanac (Tables V-A and V-B). Considerations of space alone forbid the reproduction of these tables, which have the merit of yielding certain important corollaries, one of which (viz., that Mars cannot retrograde in Maghā nakshatra in Kārttika-Margaśīrsha months) is made use of in paper No. V in the appendix *On the astronomical references in the Mahābhārata.*

Table illustrating the process of obtaining, from the calculated places of Mars, Mercury, Jupiter, Venus of 363, 355, 344, 248 and 383 years, respectively

Days of solar year		0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
	A.D.	Degrees of longitude.															
Mars A.D. 1967=	1684	180·0	176·5	173·5	171·7	171·2	172·1	174·1	177·1	180·5	184·8	189·6	194·7	200·4	206·2	212·3	218·7
	1683	182·4	178·9	175·8	173·9	173·0	173·6	175·6	178·4	181·8	186·0	190·7	195·7	201·5	207·3	213·2	219·6
	1762	184·8	181·4	178·1	176·1	175·0	175·4	177·1	179·7	183·0	187·1	191·8	196·7	202·5	208·3	214·1	220·5
	1841	187·2	183·9	180·4	178·3	177·0	177·2	178·6	181·0	184·3	188·3	192·9	197·7	203·5	209·3	215·0	221·4
	1920	189·6	186·4	182·7	180·5	179·0	179·0	180·1	182·3	185·6	189·5	194·0	198·7	204·5	210·3	215·9	222·3
	1999	192·1	188·9	185·2	182·7	181·1	180·8	181·7	183·8	186·9	190·7	194·9	199·8	205·2	211·0	216·9	223·2
Δ or variation from cycle to cycle.		+2·4	+2·5	+2·3	+2·2	+2·0	+1·8	+1·5	+1·3	+1·3	+1·2	+1·1	+1·0	+1·0	+1·0	+0·9	+0·9
Mercury A.D. 1986=	1631	332·8	345·5	2·3	20·6	39·7	58·6	75·9	90·8	100·5	100·1	92·8	91·0	98·8	112·1	128·7	146·3
	1677	332·8	345·3	2·1	20·4	39·4	58·4	75·7	90·7	100·6	100·7	93·4	91·2	98·8	111·9	128·5	146·0
	1723	332·8	345·2	1·8	20·1	39·1	58·1	75·5	90·6	100·7	101·2	94·1	91·5	98·7	111·8	128·2	145·7
	1769	332·8	345·1	1·5	19·8	38·8	57·8	75·3	90·5	100·8	101·7	94·7	91·8	98·6	111·6	127·9	145·5
	1815	332·8	345·0	1·3	19·6	38·5	57·5	75·1	90·4	100·9	102·2	95·4	92·1	98·6	111·5	127·7	145·2
	1861	332·7	344·9	1·1	19·3	38·2	57·2	74·9	90·3	101·0	102·7	96·0	92·4	98·5	111·3	127·5	145·0
	1907	332·7	344·8	0·9	19·1	37·9	56·9	74·7	90·2	101·1	103·2	96·7	92·7	98·5	111·2	127·3	144·7
	1953	332·7	344·7	0·6	18·8	37·6	56·6	74.5	90·1	101·2	103·7	97·3	92·9	98·4	111·0	127·0	144·5
	1999	332·7	344·5	0·4	18·6	37·3	56·4	74·2	89·9	101·3	104·2	97·9	93·2	98·4	110·9	126·8	144·2
Δ or variation from cycle to cycle.		+0·0	+0·1	+0·2	+0·2	+0.3	+0·3	+0·2	+0·2	−0·1	−0·5	−0·6	−0·3	+0·1	+0·1	+0·2	+0·2
Jupiter A.D. 1999=	1655	349·1	351·5	353·8	356·2	358·4	0·5	2·6	4·4	6·0	7·4	8·5	9·3	9·7	10·0	9·7	9·2
	1738	348·6	351·0	353·3	355·6	357·7	359·9	2·1	3·8	5·3	6·8	7·8	8·6	8·8	9·1	8·7	8·3
	1821	347·5	349·9	352·2	354·5	356·6	358·8	0·9	2·6	4·1	5·5	6·5	7·3	7·5	7·7	7·3	6·8
	1904	346·4	348·8	351·1	353·4	355·5	357·7	359·7	1·4	2·9	4·2	5·2	6·0	6·2	6·3	5·9	5·3
	1987	345·3	347·7	350·0	352·3	354·4	346·6	358·5	0·2	1·7	2·9	3·9	4·7	4·9	4·9	4·5	3·8
Δ or variation from cycle to cycle.		1·1	1·1	1·1	1·1	1·1	1·1	1·2	1·2	1·2	1·3	1·3	1·3	1·3	1·4	1·4	1·5

N.B.—For the top line, **A.D.** 1655, the figures for **A.D.** 1999 have been repeated: but as the cyclic variation between **A.D.** 1999 and **A.D.** 1987 by 4, that the figure for Jupiter for **A.D.** 1655 is in excess of the figure for **A.D.** 1999 (344 years of the difference between **A.D.** 1655 and **A.D.** column the figure for **A.D.** 1987 is 345·3 and that for **A.D.** 1999 is 349·1, a difference of 3·8. We add ·6 to 3·8 in order to get an exact quotient (1·1)

Venus A.D. 1999		38·0	49·0	61·2	72·1	83·0	93·4	103·3	102·5	120·5	126·6	130·6	131·0	127·5	121·2	115·7	113·8
	2007=1772	38·5	49·9	61·6	72·5	83·3	93·4	103·1	112·1	119·6	125·1	128·1	127·5	123·5	117·5	113·0	112·0
	2015=1780	39·0	50·4	62·0	72·8	83·5	93·5	103·0	111·6	118·8	123·7	125·7	124·1	119·5	113·9	110·2	110·3
	2023=1788	39·5	50·9	62·4	73·1	83·7	93 6	102·9	111·1	117·9	122·3	123·2	120·7	115·5	110·2	107 4	108·5
	2031=1796	40·0	51·4	62·8	73·4	83·9	93·7	102·8	110·6	117·1	120·8	120·8	117·3	111·5	106·5	104·6	106·7
	2039=1804	40·5	51·9	63·2	73·7	84·1	93·8	102·7	110·1	116·2	119·3	118·3	113·9	107·5	102·8	101·8	105·0
Δ or variation from cycle to cycle.		+0·5	+0·5	+0·4	+0·3	+0·2	+0·1	−0·1	−0·5	−0·8	−1·5	−2·4	−3·4	−4·0	−3·7	−2·8	−1·8
Saturn A.D. 1969=	1586	3·4	4·7	6·0	7·3	8·5	9·7	10·9	11·8	12·7	13·7	14·1	14·5	15·0	14·9	14·9	14·6
	1645	4·3	5·6	6·9	8·2	9·4	10·6	11·8	12·7	13·6	14·6	15·1	15.5	16·0	15·9	15·8	15·7
	1704	5·2	6·5	7·8	9·1	10 3	11·5	12·8	13·7	14·6	15·6	16·1	16·6	17·1	17·0	16·9	16·8
	1763	6·1	7·4	8·7	10·0	11·2	12·5	13·7	14·6	15·6	16·6	17·1	17·6	18·1	18·1	18·0	17·9
	1822	7·0	8·3	9·6	10 9	12·1	13·4	14·7	15·6	16·6	17·6	18·1	18·7	19·2	19·2	19·1	19·0
	1881	7·9	9·2	10·5	11·8	13·0	14·3	15·6	16·6	17·6	18·6	19·1	19·7	20·3	20·3	20·2	20·1
	1940	8·8	10·1	11·4	12·7	14·0	15·3	16·6	17·6	18·6	19·6	20·2	20·8	21·4	21·4	21·3	21·3
	1999	9·8	11·1	12·4	13·7	15·0	16·3	17·6	18·6	19·6	20·6	21·2	21·8	22·4	22·4	22·3	22·3
Δ or variation from cycle to cycle.		+0·9	+0·9	+0·9	+0·8	+0 9	+0·9	+0·9	+1·0	+1·0	+1·0	+1·0	+1·0	+1·1	+1·1	+1·0	+1·0

and Saturn, for 126, 79, 95, 48 and 88 years, respectively, the actual places of the same planets for cycles (see paragraph 311, page 127 of text).

160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360
Degrees of longitude.																				
225·2	232·1	239·1	246·2	253·3	260·6	268·0	275·8	283·2	290·9	298·7	306·3	314·1	321·8	329·5	336·9	344·5	352·2	359·7	7·0	14·4
226·1	232·9	239·9	247·0	254·1	261·4	268·8	276.6	284·0	291·7	299·5	307·1	314·9	322·6	330·2	337·7	345·5	352·9	0·4	7·6	15·0
227·0	233·7	240·7	247·8	254·9	262·2	269·6	277·4	284·8	292·5	300·8	307·9	315·7	323·4	330·9	338·5	346·2	353·6	1·1	8·2	15·6
227·9	234·5	241·5	248·6	255·7	263·0	270·4	278·2	285·6	293·3	301·1	308·7	316·5	324·2	331·6	339·3	346·9	354·3	1·8	8·8	16·0
228·8	235·3	242·3	249·4	256·5	263·8	271·2	279·0	286·4	294·1	301·9	309·5	317·3	325·0	332·3	340·1	347·6	355·0	2·5	9·4	16·8
229·7	236·2	243·3	250·4	257·5	264·9	272·3	279·8	287·5	295·1	302·7	310·3	318·8	325·7	333·1	340·8	348·2	355·7	3·0	10·2	17·5
+0·9	+0·8	+0·8	+0·8	+0·8	+0·8	+0·8	+0·8	+0·8	+0·8	+0·8	+0·8	+0·8	+0·8	+0·7	+0·8	+0·7	+0·7	+0·7	+0·6	+0·6
164·3	181·5	196·9	208·7	213·0	208·1	201·6	203·4	213·8	228·4	244·1	262·8	280·0	296·6	310·3	318·9	317·9	311·4	309·2	317·4	331·0
164·0	181·3	196·8	208·7	213·2	208·7	202·1	203·5	213·6	228·2	244·0	262·5	279·8	296·4	310·2	319·1	318·3	311·8	309·5	317·3	330·8
163·7	181·0	196·6	208·7	213·5	209·3	202·5	203·7	213·5	228·0	243·9	262·2	279·6	296·2	310·1	319·2	318·8	312·3	309·7	317·2	330·7
163·4	180·8	196·4	208·6	213·7	209·9	202·9	203·8	213·4	227·8	243·8	261·9	279·4	296·0	310·0	319·3	319·3	312·7	309·9	317·1	330·5
163·2	180·6	196·2	208·6	214·0	210·5	203·4	204·0	213·3	227·6	243·7	261·6	279·2	295·8	309·9	319·4	319·8	313·2	310·1	317·0	330·4
162·9	180·4	196·0	208·6	214·2	211·1	203·8	204·1	213·2	227·4	243·6	261·3	279·0	295·6	309·8	319·5	320·3	313·6	310·3	316·9	330·2
162·6	180·2	195·8	208·5	214·5	211·6	204·2	204·3	213·1	227·2	243·5	261·0	278·8	295·4	309·7	319·6	320·8	314·1	310·5	316·8	330·1
162·3	180·0	195·6	208·5	214·7	212·1	204·6	204·4	213·0	227·0	243·4	260·7	278·6	295·2	309·6	319·7	321·3	314·5	310·7	316·7	329·9
162·1	179·7	195·5	208·5	215·0	212·6	204·9	204·6	212·9	226·9	243·2	260·4	278·3	295·0	309·6	319·8	321·8	315·0	310·9	316·7	329·8
+0·3	+0·2	+0·2	+0·0	−0·2	−0·5	−0·3	−0·2	+0·1	+0·2	+0·2	+0·3	+0·3	+0·2	+0·1	−0.1	−0·5	−0·5	−0·2	+0·1	+0·1
8·4	7·2	5·9	4·5	3·2	1·8	0·7	0·0	359·4	359·1	359·4	359·9	0·7	1·9	3·3	4·9	6·6	8·7	10·9	13·0	15·4
7·3	6·2	5·0	3·6	2·3	0·7	359·7	359·1	358·4	358·4	358·5	359·1	359·9	1·1	2·6	4·4	6·1	8·1	10·2	12·6	14·9
5·8	4·6	3·4	2·0	0·7	359·2	358·2	357·6	357·0	357·0	357·2	357.8	358·7	359·9	1·4	3·2	5·0	7·0	9·1	11·5	13·8
4·3	3·0	1·8	0·4	359·1	357·7	356·7	356·1	355·6	355·6	355·9	356·5	357·5	358·7	0·2	2·0	3·9	5·9	8·0	10·4	12·7
2·8	1·4	0·2	358·8	357·5	356·2	355·2	354·6	354·2	354·2	354·6	355·2	356·3	357·5	359·0	0·8	2·8	4·8	6·9	9·3	11·6
1·5	1·6	1·6	1·6	1·6	1·5	1·5	1·5	1·4	1·4	1·3	1·3	1·2	1·2	1·2	1·2	1·1	1·1	1·1	1·1	1·1

1655 is + ·48, and the variation in geocentric place corresponding to this is found by trial to be from ·4 to ·7, it is assumed, in order to facilitate the division later) by ·4, ·5, ·6 or ·7 degree according as one of these figures is required to make a complete division of the difference by 4. Example: In the **0** day on division by 4, and assume that the cyclic variation for geocentric place between **A.D.** 1655 and **A.D.** 1999 is + 0·6 in favour of the former year.

116·0	121·1	128·5	137·2	146·8	157·1	168·0	176·2	190·6	202.5	214·4	226·4	238.7	251·0	263·3	275·6	288·0	300·4	312·9	325·2	337·7
115·0	120·0	128·2	137·2	147·2	157·3	168·5	179·6	191·1	203·1	215·0	226·9	239·3	251·7	264·0	276·3	288·6	301·1	313·6	325·9	338·4
113·9	120·0	128·0	137·1	147·5	157·6	169·1	180·0	191·6	203·6	215·5	227·5	239·9	252·3	264·6	276·9	289·3	301·7	314·2	326·6	339·0
112·9	119·4	127·8	137·1	147·9	157·9	169·7	180·4	192·1	204·1	216·1	228·1	240·5	252·9	265·3	277·6	290·0	302·4	314·9	327·3	339·7
111·8	118·9	127·6	137·0	148·2	158·2	170·3	180·8	192·6	204·6	216·7	228·7	241·4	253·6	265·9	278·2	290·7	303·0	315·5	328·0	340·3
110·7	118·4	127·4	137·1	148·5	158·5	170·9	181·2	193·1	205·1	217·2	229·3	241·7	254·2	266·5	278·9	291·4	303·7	316·2	328·7	341·0
−1·0	−0·5	−0·2	−0·0	+0·3	+0·3	+0·6	+0·4	+0·5	+0·5	+0·6	+0·6	+0·6	+·06	+0·6	+0·6	+0·6	+0·6	+0·6	+0·7	+0·7
14·0	13·4	12·7	11·9	11·1	10·2	9·5	8·8	8·1	7·9	7·7	7·4	7·8	8·2	8·5	9·4	10·3	11·1	12·3	13·5	14·7
15·1	14·5	13·8	13·0	12·2	11·3	10·6	9·9	9·2	9·0	8·7	8·4	8·8	9·2	9·5	10·4	11·2	12·0	13·2	14·4	15·6
16·2	15·7	15·0	14·2	13·4	12·5	11·8	11·1	10·4	10·1	9·8	9·5	9·8	10·2	10·5	11·4	12·2	13·0	14·2	15·4	16·6
17·4	16·8	16·1	15·3	14·5	13·6	12·9	12·2	11·5	11·2	10·9	10·6	10·9	11·2	11·5	12·4	13·2	14·0	15·1	16·3	17·5
18·5	18·0	17·3	16·5	15·7	14·8	14·1	13·4	12·7	12·3	12·0	11·7	12·0	12·2	12·5	13·4	14·2	14·9	16·1	17·2	18·4
19·6	19·1	18·5	17·7	16·9	16·0	15·3	14·6	13·8	13·4	13·1	12·8	13·0	13·2	13·5	14·4	15·2	15·9	17·0	18·1	19·3
20·8	20·3	19·7	18·9	18·1	17·2	16·5	15·8	15·0	14·6	14·2	13·9	14·1	14·3	14·6	15·4	16·2	16·9	18·0	19·1	20·3
21·8	21·3	20·7	19·9	19·1	18·2	17·5	16·8	16·0	15·6	15·2	14·9	15·1	15·3	15·6	16·4	17·2	17·9	19·0	20·1	21·3
+1·1	+1·1	+1·1	+1·1	+1·1	+1·1	+1·1	+1·1	+1·1	+1·1	+1·1	+1·1	+1·1	+1·0	+1·0	+1·0	+1·0	+1·0	+1·0	+0·9	+0·9

SECTION IV.—*The Planetary Eye-tables.*

318. The planetary eye-tables for Mars, Mercury, Jupiter, Venus and Saturn, which are included in Table IV, constitute an important by-product of the perpetual planetary almanac. The general nature and use of the planetary eye-tables has been referred to in paragraph 225 supra (page 93) and it only remains to explain how the eye-tables were constructed. The object is to ascertain for each mean longitude of a planet, whether superior or inferior, say for 0°, 10°, 20°, . . . 350° of its mean longitude, the corresponding actual geocentric place attainable by it on each day of the Indian solar year, say on 0 day, on the 10th complete day . . . on the 360th complete day and *vice versa*. Supposing we wished to have such an eye-table in 36 stages, for each planet, and for every ten complete days of the Indian solar year (like the eye-tables we actually possess in Table IV), it would be theoretically necessary to compute, in the manner shown in paragraphs 237 and 239 supra (pages 96, 97), the actual geocentric places corresponding to $5 \times 36 \times 36 = 6{,}480$ mean positions, which might take a whole year or more to compute.

319. As an alternative to this formidable undertaking, we simply note, in the perpetual planetary almanac (Table V-B), the occasions on which 0°, 10°, 20° . . . 350° are attained as geocentric places, on the 0 day of the solar year, first by Mars, then by Jupiter, and thirdly by Saturn; then, the occasions on which 0°, 10°, 20°, etc., are attained as geocentric places by the same planets on the 10th complete day of any solar year; and so on up to 360 complete days of the solar year. Having secured these occurrences, we tabulate them, and add to each geocentric place the corresponding mean longitude, which is easily done with the help of Table V-A. The result is the eye-table for each of the superior planets Mars, Jupiter and Saturn.

320. For the *inferior* planets Venus and Mercury, we first of all tabulate their increases of mean longitude, for every 10 days, for 235 years in the case of Venus, and for 46 years in the case of Mercury. Then we select from Table V-B the actual geocentric places corresponding to definite stages of increase of these mean longitudes. As a result, the eye-table for Venus presents the same general appearance as the eye-table for Mars, Jupiter and Saturn, but whereas the vertical heavy-type column in the eye-tables of Mars, Jupiter and Saturn presents actual geocentric places, and the body of the tables presents mean longitudes, the first vertical column in the eye-table of Venus furnishes *mean* longitudes and the rest of the table presents the geocentric places. This variation in the eye-table for Venus is a necessity, because, to every single mean longitude of Mars, on, say, the 100th day of the Indian solar year, there corresponds but a single geocentric place, and *vice versa*, whereas the *vice versa* does not hold good in the case of Venus: for instance, on the 160th complete day of the Indian solar year, Venus may have a geocentric place of 164° when her mean longitude is 180°, and she will have the same geocentric place also when her mean longitude is 329°.

321. In the case of the Mercury eye-table, there is a further peculiarity. All the possible positions, whether mean or actual, of Mercury on a given day of the Indian solar year are reducible to 46 definite types, exemplified by the years noted in column 1 of Mercury's eye-table and the actual positions in other years do not vary from these excepted to the extent of a degree or two. It was, therefore, thought advisable to retain these types themselves as an eye-table: it thus happens that for every 10th day of the Indian solar year the Mercury eye-table presents 46 stages at intervals of about 8°, instead of 36 stages at intervals of 10° between one stage and the next, as in the case of the other planets.

322. It was stated in paragraph 268 supra (page 107) that the eye-tables can be used for the purpose of computing the actual geocentric places of the five planets in the *Paripāḍal* horoscope. We may now compare the results of applying to the calculation of this date (1) the rigorous method presented in paragraphs 237, 239 supra (pages 96, 97), (2) Tables V-A and V-B, (3) the planetary eye-tables.

—	Mars.	Mercury.	Jupiter.	Venus.	Saturn.
Mean longitude on 89th complete day A.D. 634, i.e., 17th June, time about mean sunrise.	331·92°	11·56°	330·83°	296·23°	260·41°
(1) Actual geocentric place by strict calculation, paragraphs 237 and 239 (pages 96 and 97).	17·12°	70·4°	340·5°	41·6°	256·4°
(2) Actual geocentric place by Tables V-A and V-B (page 112 supra).	17·5°	70·4°	340·6°	42·3°	256·4°
(3) Actual geocentric place by planetary eye-tables (Table IV).	17·1°	70·4°	341·0°	42·7°	256·0°

It will be seen that, although the planetary eye-tables omit fractions of a degree, yet the results yielded by them are accurate enough for all practical purposes.

323. The eye-tables have, however, one drawback, as compared with tables V-A and V-B. When a planetary eye-table is used, as in the last paragraph, for ascertaining the geocentric place of a planet directly from its mean longitude on a given day of the Indian solar year, proportionate parts will generally have to be taken, and that, more than once in each case. Thus in the case dealt with in the last paragraph, the reader, on looking into the Mars and Mercury eye-tables, will find certain entries under the 80th and 90th completed days, which he should proceed to manipulate as shown below:—

Mars.

Col. 1. Actual geocentric place (Eye-table.)	Col. 2. Mean longitude on 80th complete day. (Eye-table.)	Col. 3. Mean longitude on 90th complete day. (Eye-table.)
10°	325°	324°
20°	338°	335°

By taking proportional parts for the 89th day, we find that Mars, on 89th complete day,

would have attained 10° actual geocentric place for a mean longitude of **324°** ... (1)

and would have attained 20° actual geocentric place for a mean longitude of **335·3°** ..... (2)

By taking proportional parts again with reference to (1) and (2), we see that if Mars on 89th complete day attained, with an increase of 11·3° mean longitude (i.e., 335·3° — 324°), an increase of 10° in actual geocentric place, he would, with an increase of 8° mean longitude, attain an increase of $\frac{8 \times 10}{11 \cdot 3} = 7 \cdot 1°$ in actual geocentric place. In other words, on the 89th complete day Mars' geocentric place, corresponding to mean longitude 332° = 10° + 7·1° or 17·1°, which is exactly the result obtained by strict calculation in accordance with paragraph 239, page 96 supra.

Mercury.

From the following entries in Mercury's Eye-table under 80th and 90th complete days,

80th complete day.		*90th complete day.*		
i.e., mean longitude ...	332°	mean longitude	13°	(1)
actual geocentric place ...	57°	actual geocentric place ...	71°	

we obtain, by proportional parts for 89th complete day,

mean longitude	**9°**	
actual geocentric place ...	**69·8°**	(2)

similarly, from the following entries under 80th and 90th complete days,

80th complete day.		*90th complete day.*		
mean longitude	339°	mean longitude	20°	(3)
actual geocentric place ...	58°	actual place	73°	

we obtain, by proportional parts, for 89 complete days,

mean longitude	**16°**	
actual geocentric place	**71·5°**	(4)

Lastly from (2) and (4) we reason as follows, by proportional parts :—

with an increase of 7° in mean longitude (i.e., 16° — 9°) Mercury attains an increase in geocentric place of 1·7° (i.e., 71·5° — 69·8°).

with an increase of 2·6° in mean longitude (i.e., 11·6° — 9°) Mercury attains an increase in geocentric place of $\frac{2·6 \times 1·7}{7} = \frac{4·42}{7} = ·63°$.

That is, on 89th complete day, Mercury's actual place, corresponding to mean longitude (9° + 2·56°) or 11·56°, = **69·8°** + ·63° = **70·4°**, which is exactly the result obtained by strict calculation in accordance with paragraph 237, page 95, supra.

324. In taking proportional parts for the 89th complete day, the eye-tables for Jupiter and Saturn should be used in the same way as the eye-table for Mars.

325. For Venus, we have, by the Venus Eye-table.

Col. 1. Mean longitude.	Col. 2. Actual geocentric place on 80th complete day.	Col. 3. Actual geocentric place on 90th complete day.	Col. 4. Therefore actual geocentric place on 89th complete day (by proportional parts).
290°	32°	**47°**	**45·5°**
300°	31°	42°	**40·9°**

That is, we find, from the first and last columns, that with an increase in mean longitude of 10° (i.e., 290° to 300°), Venus undergoes a decrease in geocentric place of 4·6° (i.e., 45·5° — 40·9°).

Therefore, with an increase in mean longitude of 6° (i.e., 296° — 290°), Venus undergoes a decrease in geocentric place of 6 × ·46° = 2·76°.

In other words, on 89th complete day, Venus' geocentric place, corresponding to a mean longitude of 296·23°, = **45·5°** — 2·76° = **42·7°**, which is within 1 degree of the result obtained by strict calculation in accordance with paragraph 237, page 95, supra.

SECTION V.—*Eclipses and Eclipse chronology.*

326. All over the world, and whatever system of chronology may be followed in any particular country, a recorded eclipse is an unerring landmark for the chronologist, and therefore the energy of mathematicians since the 16th century A.D. has been expended on the production of lists of eclipses for ancient as well as modern times. In such lists the path of each solar eclipse is often noted, showing in what parts of the terrestrial globe it was central and where it was visible. Oppolzer's *Kanon der Finsternisse*, which is generally regarded as a standard work on the subject, describes the eclipses, both lunar and solar, from 1207 B.C. to A.D. 2161 and is fully illustrated with charts. For eclipses comprised within this period, no other guide is necessary, and it happens that the most ancient eclipses recorded anywhere in history fall within this period. Professor Newcomb's *Tables of Solar Eclipses from* 700 *B.C. to A.D.* 2300, and Dr. Gratton Guinness' very accurate list of lunar eclipses in his *New Moons and Vernal Equinoxes* (B.C. 1622 to A.D. 1934) may also be referred to. Lastly, frequent use has been made in the course of this work of a French work, first published in the 18th century, *L'Art de Vérifier les dates*, which gives all kinds of eclipses in some detail from A.D. 1 to A.D. 2000. The eclipses in Sir A. Cunningham's *Book of Indian Eras* are reproduced from the French work. Italicized solar eclipses in IV-L will generally be found in Oppolzer, but not in the French work. The reason why such eclipses are omitted in the French work is given in paragraph 345 below.

327. But in India public curiosity occasionally fastens itself on eclipses which are more ancient than any recorded in the above works, and which there is no known means of dating, because the literary documents referring to them are themselves destitute of any historical dates. For instance, a solar eclipse is believed to have occurred on the day when Rāma was to have been crowned, and when, instead being of crowned, he went into exile. Bentley referred this eclipse to 940 B.C., July 2. In the Mahābhārata two eclipses, occurring in the course of a fortnight (this is the most sensible construction that can be placed on a passage which literally means that both a lunar and a solar eclipse occurred on the same day, which is physically impossible), are said to have preceded the great battle, and

these eclipses must have occurred, according to the commentators, in the lunar month of Kārttika or Mārgaśīrsha. But there are no dates in either the Rāmāyaṇa or the Mahābhārata, and as there is nothing whereon we can base even an approximation to a date, critics and investigators imagine dates, more or less hypothetical, for the events of the Rāmāyaṇa or for those of the Mahābhārata and seek to establish their hypothesis by showing that there were eclipses on those dates.

328. It is not, however, solely to gratify such speculative curiosity that the following tables have been devised. A recorded eclipse is a genuine and solid landmark in history ; but ancient records of eclipses, equally with those of other events, are often not quite exact in detail, and then it is necessary to ascertain by other means whether there was an eclipse on a particular date and what was its nature and extent. An eclipse obeys certain laws of cyclic recurrence, like a tithi or a nakshatra or a planet ; and it is the object of this section to define and exemplify the cycles which will be found most useful in practical investigation, and which will enable us to satisfy ourselves whether an eclipse which is believed to have occurred on a certain date did occur, or could have occurred at that time.

329. An eclipse cycle may be defined as a period, composed of a certain number of partial or complete solar years, after which the sun's distance from a node is the same at new moon (in the case of a solar eclipse), or at full moon (in the case of a lunar eclipse), and the sun's and moon's anomalies are also nearly the same, as at the beginning of the period. A *perfect* eclipse cycle in this sense probably does not exist, but there is no harm in using an imperfect cycle, provided we apply from time to time the correction, which we may call the cyclic variation.

330. It was stated in paragraph 140, page 40, supra, that in order that an eclipse may be possible, the sun should be within a certain distance from either of the moon's nodes. For a solar eclipse, it suffices if the sun is between 0° and 16·2° from a node : indeed a solar eclipse is possible so long as the sun is not more than 18·9° from a node. For lunar eclipses, the limits are much narrower : for a lunar eclipse to be fairly certain, the sun must not be more than 10·44° from a node, and when his distance from a node is between 10·44° and 13·86°, a lunar eclipse is possible, not probable. It follows from the tables of Rāhu's (IV-K) and sun's (IV-C) motions, that the distance of the sun from the node diminishes every day at the rate of 1·0386015 degree, and the interval from the moment when the mean sun is at a node to the moment when he is at the same node again is $\frac{360°}{1·0386015} = 346·61996$ days. This is the period of a joint revolution of the sun and node, fixed by modern astronomy ; but when using this period in Indian astronomy, we have to make the same allowance for the annual displacement of the 0° point of longitude in Indian astronomy as we did in paragraph 219, page 91, supra, in the case of the planets. Applying the same method to the distance of the sun from the node, or as it is shortly called, " Sun from node," we proceed as follows :—

Sun and node together do $\frac{360°}{346·61996} = 1·0386015$ degrees per day (modern astronomy).

Sun alone does $\frac{360°}{365·25636} = ·9856091212$ degree per sidereal day (modern).

∴ node alone does $1·0386015 - ·9856091 = ·0529924$ degree per day (modern).

And a given node does 360° in $\frac{360°}{·0529924} = 6793·4269$ days $= 18·59906$ sidereal years (modern).

In 18·59906 years, the displacement of sun's 0° longitude (vide paragraph 217, page 90, supra) $= 18·59906 \times ·002361° = ·04391238°$.

But the node travels ·0529924 degree per day in a direction opposite to that of the sun.

∴ it travels ·0439124° in $\frac{·0439124}{·0529924} = ·8286453$ day.

∴ node, by Indian astronomy, must be held to complete an orbit in $6793·4269 - ·8286 = 6792·5983$ days.

∴ node, by Indian astronomy, travels in one day $\frac{360°}{6792·5983} = ·0529988°$.

But the sun, by Indian astronomy (Sūrya Siddhānta), in one day travels ·9856026°.

∴ sun and node, by Indian astronomy, together travel in one day 1·0386014°.

And sun and node travel in 1 year 1·0386014 × 365·25876° = 379·3583°.

∴ Sun and node together travel in 360° in $\frac{360°}{1·0386014}$ = 346·61998337 days.

According to Sūrya siddhānta, the last figure, as observed by Professor Jacobi in *Epig. Ind.*, Vol. I, page 442, ought to be 346·6246334 days: but inasmuch as the only use ordinarily made of the distance of sun from node in chronological investigations is in connexion with eclipses, and eclipses are peculiarly a matter of observation and therefore a matter which, to be safe, should, as far as possible, be regulated by the quantities of modern astronomy, we adopt, for the period of joint revolution of the sun and node, 346·61998337 days which, as compared with the figure adopted in modern astronomy, involves a slight correction for the annual displacement of the sun's 0° longitude in Indian astronomy.

331. The other quantities which we shall make use of in Table IV-L follow from those above settled. The length of a tithi, as a fraction of a day, by Sūrya siddhānta = $\frac{29·530587946}{30}$ = ·9843529315 of a day.

The joint motion of sun and node for one tithi = ·9843529315 × 1·0386014 = 1·02235033275 degrees.

∴ The joint motion of sun and node for 360 tithis, or an ordinary lunar year of 12 months = 360 × 1°·02235033275 = (36) 8·046011979 degrees; and the joint motion of sun and node for 390 tithis or 13 lunar months (when the lunar year includes an ādhika month) = 3 (9) 8·716521961°.

N.B.—Tables for readily calculating the distance of sun from node for any number of days or years will be found at the end of this section.

332. We now proceed to define the principal cycles which we shall use in investigating the recurrence of eclipses. The first is the famous saros of 18 years and 10 days, which has been known at any rate in the west from a period of remote antiquity.

(1) (*a*) 18 Indian sidereal years = 6,574·65768 days (Sūrya siddhānta).
(*b*) 223 synodical months = 6,585·321124 days (Sūrya siddhānta).
(*c*) 19 joint revolutions of sun and node = 6,585·779684 days (Ephemeris).

Difference between (*a*) and (*b*) = 10·66344 days.
Difference between (*b*) and (*c*) = − ·45856 of a day, or, at the rate the daily joint motion of the sun and node already arrived at, + ·4762°. In other words, in 18 Indian sidereal years + 10·66344 days, the distance of the sun from node advances by + ·4762°. The reader should reason out for himself why the result is + ·4762° and not — ·4762°.

(2) (*a*) 19 sidereal years (Indian) = 6,939·916364 days.
(*b*) 235 synodical months (Sūrya siddhānta) = 6,939·6881565 days.
This is the Metonic cycle, which is as ancient and as interesting as the saros.
(*c*) 20 joint revolutions of sun and node (Ephemeris) ... ... = 6,932·3996674 days.
In 235 synodical months (Sūrya siddhānta) difference between (*b*) and (*c*) ... ... = 7·2884891 days.

In this interval the distance of the sun from the node decreases by 7·2884891 × 1·0386014° = 7·5698349831°.

The Metonic cycle can be applied to eclipses when the sun is very near a node at one of the eclipses compared. For example, on the 87th day of A.D. 1 (Table IV-L, first line) the distance of the sun from node was 3·41°. Nineteen years later, the distance must have decreased by 7·57°, i.e., the distance then was —4·16°, at which distance an eclipse was still probable. We find from Table IV-L that on the 87th completed day of A.D. 20 there was a solar eclipse at which the sun's distance from node was — 4·16°.

(3) (*a*) 358 synodical months (Sūrya siddhanta) = 10571·9504682 days.
(*b*) 30½ joint revolutions of sun and node (Ephemeris) ... ... = 10571·909390 days.

(*c*) 29 Indian sidereal years (Sūrya siddhanta) = 10592·503924 days.
Difference between (*a*) and (*c*) ... ... = 20·6 days.
Difference between (*a*) and (*b*) ... ... = + ·041 day,
or — ·04258°.

This cycle of 29 years *less* 20·6 days is the foundation of the next two cycles.

		Days.
(4) (*a*)	716 synodical months (Sūrya siddhānta) ...	= 21143·9009364
(*b*)	61 joint revolutions of sun and node (Ephemeris)	= 21143·818780
(*c*)	58 Indian sidereal years (Sūrya siddhānta) ...	= 21185·007848
	Difference between (*a*) and (*c*)	= 41·107
	Difference between (*a*) and (*b*)	= +·082156 day or —·08516°.

This cycle of 58 years, *less* 41·1 days, is the one most frequently used in Table IV-L. (See headlines of Table IV-L.)

		Days.
(5) (*a*)	521 sidereal years (modern)	= 190298·56356
(*b*)	521 Julian years (modern and tropical) ...	= 190295·25
(*c*)	521 sidereal years (Sūrya siddhānta)	= 190299·81396
(*d*)	6,444 synodical months (Indian or modern) ...	= 190295·109072
(*e*)	549 joint revolutions of sun and node (Ephemeris)	= 190294·36902

Difference between (*d*) and (*e*) = 0·74 day or 0·76444°; difference between (*c*) and (*d*) = 4·7 days; and the difference between (*b*) and (*d*) = 0·14 day.

(*f*) In 521 Indian sidereal years, *less* 4·7 days, the moon's anomaly moves 3·1 days. (Eye-table e.)

N.B.—(i) All the quantities in this cycle of 521 Julian years are 18 times those in (3), the cycle of 29 years *less* 20 days, or 9 times those in (4), the cycle of 58 years *less* 41·1 days.

(ii) After 521 Julian years, eclipses recur on the same day of the European calendar (old style). This can be verified by means of Table II. For instance, the solar eclipse on June 9, A.D. 1 is repeated on June 10, A.D. 522. But when one of two eclipses, compared at an interval of 521 years, occurred before 14th September A.D. 1752 (when the new style was introduced into the United Kingdom) and another occurred after the above date, the day of the month will be increased by 10 or 11 days.

333. The cycles of recurrence used in Table IV-L are (1) supra, 18 years *plus* 10·66344 days, and (4) supra, 58 years *less* 41·107 days, and combinations of these, as noted at the top of the several columns in that table. Cycle No. (3) supra, 29 years *less* 20·6 days, is a good cycle for the half joint-revolution of the sun and node, and because an eclipse may occur when the sun is at either node, and at the end of 29 years *less* 20·6 days, the sun is only 0·04 degree nearer to or further from the node than he was at the beginning of this period, it follows that eclipses occur regularly at the end of every 29 years *less* 20 days. It is noted in the *Encyclopædia Britannica* (Art. *Eclipse*) that, "starting from the eclipse of Nineveh, June 15, 763 B.C. we find eclipses on May 27, 734 B.C., May 7, 705 B.C. and so on, in an unbroken series for 2,600 years down to A.D. 1843, A.D. 1872 and A.D. 1901, i.e., once in 29 years *less* 20 days, the last being the 93rd of the series."

334. The disadvantage of cycles of 29 years *less* 20·6 days in chronological investigation is that we have to reckon by half-joint-revolutions of the sun and node. By doubling this cycle to 58 years *less* 41·1 days, we secure the recurrence of meetings of the sun and node in the same degree of longitude.

335. But a pure cycle of 58 years *less* 41·1 days, like a pure saros of 18 years *plus* 10·7 days, has the disadvantage of accumulating, in a long period of time, the small difference in longitude noted above to what may turn out to be a considerable amount. Thus at the end of 9 cycles of 58 years *less* 41·1 days, or 521 Julian years, or 521 Indian sidereal years *less* 4·7 days, the sun will be at the same

distance from the node as at the beginning of this period, *less* 0·76 of a degree. The probability of an eclipse is not much affected by this difference, but after five such periods, the distance is less by 5 × ·76 = 3·8°, and if the distance of the sun from the node was 164° at the beginning of the period, at which distance an eclipse is within the bounds of possibility, it would, at the end of 5 × 521, or 2,605 years, be 164° *less* 3·8° or 160·2°, at which distance an eclipse is impossible.

336. To avoid such accumulation of cyclic differences in a long period of time, and still more to avoid the accumulation of + ·47° for every saros of 18 years, we vary the cycles, as will be seen from the headlines of Table IV-L, in such a way as to prevent any cyclic variation exceeding ·29 of a degree. This is effected by combining the 58 years' cycle occasionally with the saros of 18 years, that is, five times in the course of 1,711 years, after which the distance of the sun from node is exactly what it was at the beginning of the 1,711 years' cycle.

337. For

1,711 Indian sidereal years	=	624957·731516 days (a).
21,163 synodical months (Sūrya siddhānta)	=	624955·833844 days (b).
1,803 joint revolutions of the sun and node	=	624955·829349 days (c).

The remarkable closeness of (b) and (c), the difference between them being only ·0045 of a day, or 39 seconds of time, or ·00467 of a degree, which is only 2 seconds of an arc, makes this cycle a very useful one in chronological investigation. The difference between (a) and (b) is only 1·9 days or just under two days, which means that if we have an eclipse say on the 35th day of the Indian solar year, A.D. 1901, there was probably another eclipse in the year 1901 *less* 1711, or A.D. 190, on the 37th day, and another in A.D. 190 *less* 1711 or —1521 A.D., i.e., B.C. 1522 (vide remarks on *minus* A.D. years in paragraph 292, page 117 supra), on the 39th day, and another in B.C. (1,522+1,711) or 3,233 B.C. on the 41st day. So far as A.D. 190 and A.D. 1901 are concerned, we find this to be the case from Table IV-L (see the line of the eclipses beginning with A.D. 16, 160th day), and we know that the same must have been the case in B.C. 1522, and in B.C. 3233, though we have no records of eclipses going back so far.

338. Let us study an actual example which will illustrate exactly the use we might make of Table IV-L, and of the key prefixed to it. An ancient Babylonian record refers to an eclipse of the sun on 20th June, 1070 B.C. (*Encycl. Brit.*, Art. *Eclipse*), and we wish to verify this. In 1070 B.C. the 20th June was about the 108th day of the Indian solar year (Eye-table **k** and **q**). We know from the 1,711 years' cycle that, if the Babylonian record is correct, then 1,711 years later, i.e., in A.D. 1711—1069 or A.D. 642, there must have been a solar eclipse about the 106th completed day. Now turning to Table IV-L, we find a solar eclipse in A.D. 642, on the 105th complete day. We expected it on the 106th day, but our fixation of 20th June, 1070 B.C. as the 108th completed day of that year was a rough one, arrived at by simply deducting March 4 (Eye-table **k**, 1101 B.C.) from March 112 (the equivalent of June 20, acc. to Eye-table **q**).

339. If we calculated the exact day of the Indian solar year 1070 B.C. which corresponded to June 20, and calculated also the actual ending moment of the new moon tithi in June of 1070 B.C. and in June of A.D. 642, we would have a difference of two whole days only (according to the 1,711 years' cycle) and not of three whole days. This, however, does not vitiate our chronological result, that on 20th June, 1070 B.C. there was probably a solar eclipse, the distance of the sun from the node having then been, as on the 105th day of 642 A.D., 356·83 degrees. We know from the headlines of Table IV-L that in A.D. 642, as compared with A.D. 27, the cyclic variation for the distance of the sun from the node was + ·10 degree, so that since the distance of the sun from the node in A.D. 27 at the first solar eclipse of that year was 356·83 degrees, the distance at the corresponding eclipse of the year A.D. 642 must have been 356·93 degrees, and the distance at the corresponding eclipse of 1070 B.C. must have been also 356·93 degrees, because the cyclic variation in the distance of the sun from the

node for 1,711 years *less* 2 days is only ·004 of a degree. Lastly, if we wish to know the English equivalent of the 105th completed day of A.D. 642 we turn to Table IV-M (Table of equivalence of English and Indian days in the several centuries A.D.), which shows us that in A.D. 642 the 105th completed day of the Indian solar year was either July 3 or July 4. We see that, unlike the 521 years' cycle, the 1,711 years' cycle does not give us an eclipse in the same English month: but it is very convenient for all other purposes in chronological investigation.

340. We shall next study two ancient eclipses of the moon. In Shakespeare's *Hamlet*, Act I, scene i, there is a reference to the fact that "a little ere the mightiest Julius fell," i.e., before 15th March, 44 B.C. the moon "was sick almost to doomsday with eclipse." According to astronomers, there was an eclipse of the moon on 7th November, B.C. 45 visible at Rome two hours after midnight. The 7th November, in B.C. 45 was, by Eye-table **k** and **q**, March 252 *less* 13, i.e., the 239th completed day of the year. On the 237th completed day of A.D. 1711 *minus* 44, or A.D. 1667 we should have, if Shakespeare's reference is historical, a lunar eclipse. The key to Table IV-L shows that eclipses of the year A.D. 1667 follow the same order as eclipses of the year A.D. 14, and against A.D. 14 we find in Table IV-L, a lunar eclipse on the 237th completed day of the year A.D. 1667, just what we expected. The commentators of Shakespeare's *Hamlet* are silent as to the exact authority for his reference to a lunar eclipse in the year B.C. 45. Plutarch, who is Shakespeare's usual source of information in regard to Roman history, mentions portents, not a lunar eclipse as having preceded the assassination of Julius Cæsar. Ovid's *Metamorphoses*, Bk. xv, ll. 787—790 which, in the "Howard" Shakespeare, is cited as an authority, refers to a solar, not a lunar, eclipse. Lucan's *Pharsalia*, Bk. I, ll. 526, etc., refers no doubt to a lunar as well as a solar eclipse, but that was before the battle of Pharsalia, B.C. 48. We have good reason, however as chronologists, for supposing that Shakespeare relied on some authority more specific than Ovid, Lucan or Virgil (*Georg.* I, l. 467). Whatever Shakespeare's source of information was, the lunar eclipse alluded to by him appears to have been a solid historical fact, referrable to a definite date 7th November, 45 B.C.

Plutarch, in his life of Paullus Æmilius (Langhorne's Translation), says that when the Roman army was about to retire to rest on the eve of the battle of Pydna (June 22, B.C. 168) "on a sudden the moon was totally eclipsed." June 21 (the eve of the battle) was, by Eye-table **k** and **q** (March 113 *minus* 12 =) the 101st completed day of the Indian solar year, and about the 99th day of the year A.D. 1544 (i.e., A.D. 1711 *minus* 167) we should find a lunar eclipse, if there was one on 21 June, B.C. 168. On the 99th day of A.D. 1544, we do find a lunar eclipse (see Table IV-L, the line beginning with A.D. 24); and the sun's distance from the node then was 173·57°—·23°=173·34°. In fact there was a lunar eclipse at the end of every cycle in the line beginning with A.D. 24, 354th day.

341. The distances of the sun from the node given in the first column of Table IV-L are distances of the *mean* sun: but of course a solar eclipse depends on the distance of the actual sun, for which purpose we want the sun's equation of the centre for the day in question according to Table IV-C. Thus in the example given above (B.C. 1070, June 20) when the distance of the *mean* sun from the node of the 108th completed day of the Indian solar year was 356·93 degrees, the sun's equation of the centre was by Table IV-C, *minus* 1·0009 degree, which of course made the sun, + 1·0009 degree further from the node (because the sun moves in a direction opposite to the node), so that the actual distance of the sun from the node on the 108th completed day of 1070 B.C. was 366·93+1·00=357·93 degrees. This only made a solar eclipse more certain on the 108th day in B.C. 1070 than in A.D. 642 on the 106th day.

For a lunar eclipse also the sun must be at or near a node at the moment of an eclipse when the moon is at the opposite node: here again our tables give us the distance of the *mean* sun from a node and for his actual distance, we want not only his equation of the centre but also the elongation of the sun from the node due to the difference in time between the mean and actual ending moment of the tithi.

342. Thus, the lunar eclipse alluded to in *Hamlet*, took place on the 239th completed day of the Indian solar year 45 B.C., when the distance of the *mean* sun from the node was, by Table IV-L, 178·11 degrees (the entry in column 1 under A.D. 14, 2nd lunar eclipse) *plus* ·07 degrees (entry in the headline above A.D. 1667), or 178·18 degrees. But the interval between the actual and *mean* ending moment of this full moon tithi was as follows :

		☉'s An. days.	☾'s An. days.
Eye-table **k, l, m**, 101 B.C. March	13·16	6·54	24·26
Eye-table **n, o, p**, 56 years.	·49	10·21	8·98
	16·75	16·75	16·75
			49·99
			27·55
			22·44
Mārgaśīra Full Moon Eye-table **y**.	221·48	22·148	1·04
March.	251·83	238·23	23·48
☉'s Anomaly for 238·23 d. (Eye-table **h**.)	—·08		—·08 (☉'s An.)
			23·40
☾'s Anomaly for 23·40 d. (Eye-table **e**.)	+·32		
	+·24	.....	+·24
		March	252·07.

The actual tithi having occurred + ·24 days later than the mean tithi, the sun was thereby ·24 degree nearer the node, and the sun's equation of the centre for the 238th day being *minus* ·93 degree, he was for this reason ·93 degree further from the node : altogether the sun's distance from the node at the centre of the eclipse was 178·13 *minus* ·24 *plus* ·93 = 178·85 degrees.

The eclipse occurred at ·07 of day, Lanka time on March 252, i.e., on 7th November; at Rome the corresponding time was 4 hours 16 minutes less, or ·18 of day less than at Lanka ; in other words the time of the eclipse at Rome was ·89 of the day, that is, by Table VI, 21 hours 22 minutes after Lanka sunrise, i.e., 3 hours 22 minutes after mid-night.

The maximum effect of tithi equations being an addition to, or subtraction from, the mean ending moment, of ·58 of a day (paragraph 28, page 8 supra) and the maximum of sun's equation of the centre being 2·14 degrees, it follows that the *actual* sun may, by reason of these equations, be at a given moment nearer to or further from the node than the *mean* sun by 2·72 degrees.

343. The moon's anomaly and the sun's anomaly are therefore important considerations in the investigation of eclipses. In 87 years *less* 62 days [i.e., three times (29 years *less* 20·6 days)] the moon's anomaly, by Eye-table **p** moves only ·52 of a day: consequently, after 87 years *less* 62 days, there will not be much change due to the moon's anomaly in the relative position of the sun with reference to the node; and the *Ency. Brit.* (*loc. cit.*) therefore observes :—"In a series including every third eclipse" (i.e., every eclipse after an interval of 87 years *less* 62 days) "the eclipses will be of the same character through a thousand years or more. Thus the eclipses of A.D. 1467, 1554, 1640, 1727, 1814, 1901, 1988 are total."

344. We may here remind the reader of the observations made in paragraph 137, page 49 supra, regarding the universality of a lunar eclipse, so far as the earth's surface is concerned, and the comparatively circumscribed limits of a solar eclipse. Hence a lunar eclipse is much easier to verify than a solar eclipse. If we know the date of a lunar eclipse according to any good modern authority, we may be sure that, making allowance for terrestrial longitude, the same eclipse must have occurred over every part of the terrestrial globe illuminated by the moon. Thus in investigating the lunar eclipse referred to in the Tamil poem *Paripāḍal* (vide

paragraph 266, page 106 supra), we took the time of occurrence of the eclipse from the French work "*L'Art de Vérifier les dates,*" and applied to that time the correction due to the difference in terrestrial longitude between Paris and Madura, and found that the result agreed very closely with the actual ending moment of the full moon tithi of Āshāḍha month in the year A.D. 634, according to Ārya siddhānta.

345. The verification of a solar eclipse is not so easy. Whether a particular solar eclipse was visible in India depends on whether any part of India was 30 degrees, 40 degrees or 50 degrees north or south of the central track of the eclipse, as we shall explain in paragraphs 351 to 355 below. The central track of a solar eclipse can be laid down only by an elaborate calculation, but the best books on eclipses, like the French work above referred to, and the more modern catalogues by OPPOLZER indicate the track of every important eclipse. Eclipses which could have been observed only in inaccessible regions of the earth, or which were wholly confined to America are not included in the French work, though they are in OPPOLZER. When an eclipse is alluded to in an Indian record, we do not generally know whether it was an eclipse strictly visible in India or an eclipse which, owing to the proximity of the sun to the moon's node, was bound to occur, and to be visible, somewhere on the earth. Table IV-L serves the useful purpose of indicating all possible eclipses, those visible somewhere in the northern half of the eastern hemisphere being printed in ordinary type, while those visible in India between A.D. 1 and A.D. 2000 are distinguished by asterisks. When the solar day on which an eclipse (solar) was due is indicated by italics in Table IV-L, it means that the eclipse will probably be found in OPPOLZER, but is not given in the French work, having been excluded from the latter, either because it was hardly noticeable, or because it did not occur in an inhabited part of the Old World. (The object of the French work, like that of the present work, is to help students of chronology in verifying dates; and eclipses which could have been observed only in the polar regions or in remote seas, are not catalogued by it : nor does it catalogue eclipses which could have been observed only in America, because before the discovery of America, there were no records in the New World, at any rate none that are available to us for study : we know that the Aztecs of Peru made astronomical observations in pre-Columbus days and have left behind pictorial records of the same, but no clue has been found which will enable us to decipher them). If *every* one of the 8,000 solar eclipses catalogued in OPPOLZER were taken into practical account, it would more often retard or confuse investigation than help it forward. For instance, if we turn to the entries of solar eclipses in the *calendar* year A.D. 1935, i.e., the year beginning on the 267th day of the Indian solar year A.D. 1934-35, corresponding to the 1st January A.D. 1935, we shall find three possible solar eclipses indicated in Table IV-L, on the 296th, 79th and 266th days. All these dates are, however, italicised in Table IV-L, because the French work omits them, but Mrs. TODD in her well-known book "*Total eclipses of the Sun,*" says : "as many as five solar eclipses in a single year are possible, but this happens very rarely ; the last occasion was early in the present century" (the book was published in 1894), "and it occurs only once—1935—in the next two and a half centuries." There is a similar remark about the year 1935 in YOUNG's *Elements of Astronomy* (1902), page 172. If we look in Table IV-L for the other two possible solar eclipses of the year 1935, we shall find them on the 267th day of the year 1934-35, and on the 108th day of the year 1935, i.e., two of the five eclipses here referred to must have occurred a month in each case before or after two other eclipses already noticed as possible. Such eclipses are hardly reckoned except in theoretical astronomy, because no eclipse that occurs on the 30th day after a previous eclipse is reckoned in practice ; in fact none of the eclipses of 1935 is assigned a track in OPPOLZER's maps, though all five are mentioned in his catalogue.

346. The reader will notice that—

(1) in certain lines of Table IV-L (and these are cases in which the sun was very near a node), eclipses, whether solar or lunar, recur almost as many times as there are cycles ; while

(2) in other lines a solar or a lunar eclipse is quite exceptional;

(3) in a few lines again all the figures are in italics, i.e., there was no eclipse which the French work thought it worthwhile to record, though most of these eclipses (if solar), will be found in OPPOLZER;

Lastly, (4) there are a few lines in which the distance of sun from node, marked in column 1 of Table IV-L is beyond the theoretical limits of possibility (i.e., beyond 18·9 degrees in the case of solar, and 13·9 degrees in the case of lunar eclipses), and nevertheless there are one or two eclipses even in these lines (see for instance, paragraph 364 below), due, no doubt, to the fact that the distance was brought within possible limits by reason of the sun's and moon's anomalies.

When, in an investigation, we come across ancient eclipses corresponding to those in Table IV-L (i.e.) to eclipses in years which were later by 1,711 years or multiples thereof, we should class the first of the four kinds of eclipses above referred as certain, the second as possible, the third as highly improbable, and the fourth as quite exceptional. Of course, if the solar day of a year under investigation is not cyclically repeated in Table IV-L (i.e., repeated after 1,711 years or a multiple thereof, with a difference of only 2 days for every such cycle), we may safely conclude that a solar eclipse was impossible on such a day. To justify us in asserting more than this in the four classes of cases, e.g., to justify the conclusion that a particular ancient solar eclipse was visible in some part of India, we need a very elaborate calculation, or a positive authority like OPPOLZER.

347. Table IV-L may be studied from different points of view:

(1) It shows practically for all time all the possible positions of the sun with reference to the nodes at which an eclipse could occur. A series of positions for 58 years, column 1 of table IV-L, having been once ascertained, may be continued, as shown in the head-lines of that table, for 1,711 years and after 1,711 years the series must recur, with a difference of only two days in the day of the solar year. As to this we may satisfy ourselves from table IV-L itself by comparing, for instance, the eclipses of A.D. 1 with those of A.D. 1712, or the eclipses of A.D. 257 with those of A.D. 1968.

(2) Table IV-L shows, in ordinary type, the eclipses of the Old World, as defined in paragraph 345 supra. These are the only eclipses with which the student of chronology in any country is likely to be concerned, until we come to quite modern times, i.e., to the 15th and subsequent centuries.

(3) Table IV-L marks with asterisks the solar eclipses visible anywhere in India between A.D. 1 and A.D. 2000.

(4) Table IV-L marks all other eclipse positions in italics. Most of these, in the case of eclipses of the sun, may be traced in OPPOLZER, though by reason of their being penumbral or of their having their central tracks elsewhere than in the Old World, they would not ordinarily interest the student of chronology.

(5) Table IV-L does not distinguish between eclipse positions, italicised because they lie outside the limits within which eclipses are possible, and small, remote or penumbral eclipses, which, though catalogued as such by OPPOLZER, do not interest the student of chronology. For instance, in the lines beginning with A.D. 11, 96·9th day (sun from node 340·26°) and A.D. 29, 107·5th day (sun from node 340·74°) the limits of an eclipse noted in paragraph 330 (18·9 degrees from a node) are exceeded and most of the eclipse positions in these lines do not figure in OPPOLZER; but there are exceptions like A.D. 1664, 136th day and A.D. 1682, 147th day (noticed in paragraph 364 below) due to the fact that the sun's anomaly brings the sun at this time of the year (August) two degrees nearer the node, that is, to within eclipse limits. Similar remarks apply to the line beginning with A.D. 17, 120th day (sun from node 199·98 degrees) and A.D. 18, 139th day (sun from node 161·26°).

348. We may analyse with the aid of OPPOLZER all the 39 eclipses in one line of Table IV-L, namely, the line beginning with A.D. 19, 276th day, and ending with A.D. 1980, 120th day.

A.D.	Day of Indian solar year.	Day of English calendar year by Table IV m.	Sunrise.		Noon.		Sunset.		Remarks.
			Long.	Lat.	Long.	Lat.	Long.	Lat.	
19	275·6*	Dec. 15	+ 89	− 4	+ 153	− 26	− 145	0	
77	*334·5*	Nov. 4	− 94	+ 7	− 36	− 21	+ 31	− 18	America and Africa.
135	193·4*	Sep. 24	+ 82	+ 6	− 146	− 13	− 148	− 30	
193	*152·3*	Aug. 14	− 102	− 2	− 42	− 1	+ 15	− 27	Do.
211	163·0	Aug. 25	+ 148	− 3	− 152	− 8	− 94	− 33	Pacific Ocean.
269	121·9	July 16	− 109	− 4	− 49	+ 13	+ 9	− 11	America and South Africa.
327	80·8*	June 6	+ 45	− 13	+ 104	+ 31	+ 172	+ 10	
385	39·7*	Apr. 26	+ 126	− 20	− 179	+ 19	− 109	+ 29	
442-3	963·8	Mar. 17	− 121	− 15	− 62	+ 15	+ 4	+ 43	
500-1	*322·7*	Feb. 3	+ 124	+ 14	− 169	− 5	− 113	+ 32	
558	*281·6*	Dec. 26	− 143	− 5	− 80	− 21	− 24	+ 10	
576-7	292·3*	Jan. 6	+ 95	− 10	+ 160	− 20	− 145	+ 14	
634	251·2*	Nov. 23	− 58	+ 2	+ 4	− 23	+ 68	− 5	
692	*210·1*	Oct. 15	− 126	+ 5	− 64	− 21	+ 7	− 26	
750	*169·0*	Sep. 5	− 94	+ 2	− 34	− 10	+ 26	− 32	
808	127·9*	July 27	+ 83	+ 2	+ 147	+ 12	− 155	− 15	
866	86·8*	June 16	− 31	− 7	+ 29	+ 22	+ 95	+ 4	
884	97·5	June 26	− 141	− 7	− 80	+ 17	− 18	− 4	
942	56·4*	May 17	+ 134	− 13	− 171	+ 24	− 102	+ 20	
1000	15·3*	Apr. 7	− 13	− 16	+ 45	+ 22	+ 119	+ 38	
1057-8	339·5	Feb. 25	− 93	− 18	− 29	+ 4	+ 32	+ 38	
1115	*298·4*	Jan. 16	− 175	− 10	− 112	− 11	− 60	+ 25	
1173	*257·3*	Dec. 6	+ 172	− 2	− 123	− 23	− 61	+ 2	
1231	216·2	Oct. 26	+ 129	+ 3	− 169	− 25	− 99	− 21	
1249	*226·9*	Nov. 6	+ 2	− 1	+ 64	− 28	+ 135	− 19	
1307	*185·8*	Sep. 27	− 115	+ 5	− 57	− 18	+ 9	− 30	
1365	*144·7*	Aug. 17	− 133	+ 6	− 69	+ 1	− 9	− 25	
1423	103·6*	July 8	+ 109	− 2	+ 170	+ 15	− 131	− 10	
1481	62·5	May 28	− 129	− 5	− 71	+ 29	− 2	+ 17	
1533	21·4	Apr. 18	− 95	− 13	− 36	+ 26	+ 41	+ 34	
1557	32·1	Apr. 28	+ 150	− 14	− 151	+ 25	− 76	+ 28	
1614-5	356·2*	Mar. 29	+ 15	− 20	+ 73	+ 13	+ 141	+ 37	
1672-3	*315·1*	Feb. 16	+ 167	− 14	− 132	+ 1	− 76	+ 37	
1730-1	274·0*	Jan. 8	− 42	− 10	+ 27	− 20	− 86	+ 14	
1788	232·9	Nov. 27	− 157	− 4	− 94	− 30	− 27	− 12	
1846	191·8*	Oct. 20	− 1	+ 7	+ 59	− 19	+ 126	− 24	
1901	*150·7*	Sep. 9	+ 163	+ 8	− 133	− 5	− 70	− 27	
1922	*161·4*	Sep. 21	+ 43	+ 5	+ 106	− 12	+ 173	− 30	
1980	*120·3*	Aug. 10	− 169	+ 1	− 108	+ 4	− 52	− 23	

* Eclipses visible in India.

349. The columns in the above table headed "Sunrise, noon and sunset" with sub-headings "Longitude and latitude" give particulars of the central track of each solar eclipse (vide page 49, paragraph 137 supra) wherefrom we may form a very fair idea of the positions of the earth's surface where an eclipse was visible centrally, that is, along the path of the moon's shadow. But as will be explained presently in paragraphs 351 to 355 below, an eclipse is also visible for at least 30 degrees of latitude to the north and an equal number of degrees to the south of the central track.

350. The moon during an eclipse, as at any other time, travels from west to east, and during a solar eclipse its shadow after striking the earth travels rapidly from west to east. This means that if a solar eclipse is seen anywhere on earth at sunrise, it will be seen at sunset at the same moment in a remote part of the earth to the east; and in some part of the earth between these limits, it will be noon at the same moment. The above table indicates by longitude (Greenwich) and latitude the spots of the earth where it was respectively sunrise, noon and sunset during each solar eclipse; and if we know the limits of latitude and longitude between which any country lies, we shall know (1) if that country or any part of it lay across the central track of the eclipse, and (2) whether in any part of the country the eclipse was visible, though not centrally, by reason of the central track passing within 30 or 40 degrees north or south of the country.

India (including Burma and Ceylon) lies between 5° and 35° north latitude and between 60° and 100° east longitude. Now, taking the first of the solar eclipses tabled above, that on 15th December A.D. 19, we see that the extreme length of the central track lay between 89° east longitude and 145° west longitude (—145° in the table means 145° longitude west of Greenwich), and a part of India (i.e., that between 89° and 100° east longitude) is comprised within these limits. Now the latitude of the central track was 4° south latitude (—4° in the table means 4° latitude south of the equator) and the eclipse, though not central, anywhere in India, was visible for at least 30° north of the central track and it must therefore have been visible over a great part of India, east of 89° east longitude.

The next solar eclipse in the table, i.e., that of 4th November A.D. 77, was central from 94° west longitude to 31° east longitude; in other words, the central track did not reach anything like the neighbourhood of India nor would it have been visible in Europe because the latitude of the central track was from 18° to 21° south latitude and from such a long way south of the equator, the eclipse could not have been seen in Europe. It is true that one part of the central track lay in 7° north latitude but its longitude was 94° west of Greenwich, which was in America not in Europe. The reader will notice that the eclipses marked with an asterisk in the above table as those which were visible in India conform to the above limits. He may, if he pleases, pursue the study of the rest of the table in the light of the above remarks.

351. We shall now subjoin a few useful remarks from the same French work as regards the limits of an eclipse whose central track is known: "An eclipse is visible at least 32 or 33 degrees to the north and as many degrees to the south of the central track; but there are times when an eclipse can be observed up to 64 degrees to the north or to the south of the central track. It is difficult to lay down precise rules on this point; but the following observations have the merit of being clear, although they may be wanting in absolute mathematical accuracy. We shall call the central track the umbra, and we shall give the name of penumbra to all that region of the earth which is comprised between the umbra and the regions where the eclipse is not visible; in other words, all the regions within which an eclipse is visible, outside the umbra, will be called the penumbra.

352. "In the month of June, that is to say, *towards the summer solstice*, at midday, if the umbra is in not more than 25 degrees of latitude, the penumbra will extend at most 32, 33 or 35 degrees to the north; it will extend 41 degrees in the same direction if the umbra is in 40 degrees of latitude; and finally if the latitude of the umbra is 50 degrees, the extent of the penumbra has no limits, because it will extend as far north as the sun illuminates the earth. Towards the

south, the penumbra will extend 32, 33, 34, or 35 degrees as long as the latitude of the umbra does not exceed 60 degrees (north latitude). At 70 degrees of latitude for the umbra, the extent of the penumbra will be 38 degrees to the south; the umbra being in 80 degrees of latitude (north), the penumbra will extend 42 degrees south of that latitude; when the umbra is in 90 degrees of latitude, that is, at the pole, the penumbra will extend 47 degrees to the south of the pole; and when the umbra is in 100 degrees of latitude, that is 10 degrees beyond the pole, the penumbra will extend 53 degrees south of the track. We see that in the last case the penumbra may extend down to France; in fact, since the track of the umbra is then in 100 degrees of latitude (that is 10 degrees beyond the pole) and since the penumbra extends for 53 degrees south of the central track, by subtracting 53 from 100 degrees, we obtain 47 degrees of latitude for the extent of the penumbra; in this case the eclipse will be visible in all parts of France, of which the latitude exceeds 47 degrees. What has been stated concerning the month of June at noon should be applied to the month of March or *the vernal equinox at sunset*, and to the month of September or the *autumnal equinox at sunrise*.

353. "*At the equinoxes at noon*, the extent of the penumbra is 32 or 33 degrees to the north if the track of the umbra lies along the equator or south of it. When the umbra is in 10 or 20 degrees of north latitude, the penumbra will extend for 37 or 44 degrees to the north of such latitude. Lastly, if the umbra runs along 26 degrees of latitude, the penumbra will extend for 64 degrees more to the north, that is to say, as far as the pole. Towards the south, the penumbra will not extend over more than 35 degrees, so long as the latitude of the umbra is not more than 35 degrees. Corresponding to a central track of the umbra in 50 degrees of latitude, is an extent of 38 degrees for the penumbra; if the umbra is in 60 degrees of latitude, the penumbra extends 42 degrees to the south thereof; if the umbra is in 70 degrees of latitude, the penumbra extends over 48 degrees to the south; when the umbra is in 80 degrees of latitude, the penumbra extends 55 degrees south; and if the umbra is at 90 degrees of latitude, that is to say at the pole, the penumbra extends 64 degrees that is to say, to regions of which the latitude is 36 degrees north. The same remark may be made about *the solstice at sunrise and sunset*; with this difference, that at the time of the solstices, when the sun is near the horizon, the extent of the penumbra is a little less to the north and a little more to the south than it is *at noon at the time of the equinoxes*; the difference is, however, not very considerable except in high latitudes.

354. "In the month of December, or *at the winter solstice, at noon*, when the central track runs through $3\frac{1}{2}$ degrees of south latitude, the extent of the penumbra is 44 degrees to the north; and when the umbra is $2\frac{1}{2}$ degrees north latitude, the extent of the penumbra is 64 degrees, that is to say, the penumbra will then touch the polar circle, beyond which, in winter, there can be no daylight. The penumbra extends south over 36, 41, 50 or 64 degrees of latitude, according as the latitude of the umbra is 20, 35, 50 or $66\frac{1}{2}$ degrees north latitude. The same remarks apply to eclipses *in March at sunrise*, and to those *in September, at sunset*.

355. "If the extent of the penumbra is 32, 33, 34 or 35 degrees, we can divide that extent into twelve nearly equal parts, and we shall have, as a result, the regions where the eclipse will appear to be one of 11 digits, of 10 digits, of 9, etc. If the penumbra is wider than the above limits, the interval between the digits will be more or less unequal; generally speaking, this distance is less towards the equator and greater towards the pole. In June at noon, in March at sunset, and in September at sunrise, there is a difference of one digit for every $2\frac{3}{4}$ degrees in the tropics, for every 3 degrees under the 45th parallel of latitude, and of 4 degrees in the polar circle. At the time of the equinoxes, at noon, and at the time of the solstices, sunrise or sunset, there is a variation of one digit for every 3 degrees in the tropics, for every 4 degrees under the 45th parallel of latitude, and for every 8 degrees in the polar circle. At the winter solstice, at noon, and also in March at sunrise and in

September at sunset, the variation is one digit for every 4 degrees in the tropics, for every 8 degrees under the 45th parallel of latitude and for every $15\frac{1}{2}$ degrees in the polar circle. These depths of the penumbra and these variations of digits are subject to a thousand further variations dependent upon the relative distances of the sun, the earth and the moon at the time of an eclipse. The figures given above are however, those corresponding to the average distances of these bodies."

356. The cycles of eclipses which we studied in paragraph 348 *supra* practically never fail because they go on for 1,711 years with practically no alteration in the distance of the sun from the node; and after 1,711 years (Indian sidereal) *less* 2 days, the sun returns to absolutely the same distance from the node as at the beginning of the 1,711 years' cycle. It will be interesting to study, by contrast, what happens if we follow a shorter cycle, the saros of 18 years *plus* 10·7 days, uninterruptedly, for a long period. Mrs. Todd in her book: '*Total eclipses of the Sun*,' gives, at page 194, a short but lucid description of such a series of eclipses. "The advent of a slight partial eclipse near either pole of the earth will herald the beginning of a new series. (On the average new cycles will begin at intervals of 30* years.) At each succeeding return, conformably to the saros, the particular eclipse will move a little further towards the opposite pole, its magnitude gradually increasing for about 200 years, but during all this time only the lunar penumbra will impinge on the earth. But when the true shadow (or umbra) begins to touch, the obscuration will have become annular or total near the pole where it first appears. The eclipse has now acquired a track, which will cross the earth slightly farther from that pole every time it returns, for about 750 years. At the conclusion of this interval, the shadow path will have reached the opposite pole: the eclipse will then become partial again, and continue to grow smaller and smaller for about 200 years additional. The series then ceases to exist, its entire duration having been about 1,150 years."

357. We shall illustrate this description by a practical example. In Table IV-L, A.D. 199, on May 13th (= 57th day of the Indian solar year), the distance of the sun from the node was 341·78 degrees, which, by our rule in paragraph 140, page 50, is near the extreme limit for the possibility of a solar eclipse. In fact neither on this day nor on the next saros, A.D. 217, May 23, is an eclipse marked (Table II). But at the next saros, A.D. 235, June 3, an eclipse is marked which is thus described in the French work:—

"6 a.m. Paris time: very small eclipse in the north of Europe."

Similar remarks, but showing that the eclipse gradually widened in area though without a track of its own, occur at the following 7 successive saroses: (2) A.D. 253, June 13; (3) A.D. 271, June 24, (4) A.D. 289, July 5, (5) A.D. 307, July 16, (6) A.D. 325, July 6, (7) A.D. 343, August 6.

We have now covered 150 years from the year A.D. 199, but according to Mrs. Todd, we must suppose the series of penumbral eclipses to have begun really 18 years earlier, that is at the new moon of May 1, A.D. 181, though it is not marked even in Oppolzer.

Two hundred years after this last date, we come upon a saros A.D. 379, August 28, when there was a solar eclipse marked in the French work, and having a track of its own. For it is thus described:—"Annular; time, Paris 0·30 p.m.; Europe and Asia; Central in the 88th parallel of latitude (that is near the pole) and 13 degrees longitude west of Greenwich; central also in the 83rd parallel of latitude and the meridian where it was then noon, that is, the meridian of Paris; central also in the 53rd degree of latitude and the 90th degree of long. east of Greenwich." So we can lay down the central track of this eclipse, from 88 degrees north latitude, 13 degrees west longitude, through 83 degrees north latitude, 2 degrees east longitude, to 53 degrees north latitude, 90 degrees east longitude. We notice that according to Mrs. Todd, "the obscuration has become annular near the pole where it first appeared" and that "the eclipse has now acquired a track."

At each successive saros, which can be easily followed by adding 18 years and 10 or 11 days every time, the eclipse crossed the earth, as stated by Mrs. Todd,

* Exactly, 29 years less 20·6 days, as we have already seen.

slightly farther and farther everytime from the north pole, for about 750 years. A.D. 1118, November 15, (Table II or IV-L) was the last saros in this series, at which an eclipse is marked, and it had by now reached the South pole. There are no further saroses with eclipses in this series.

358. There is a close connexion between the series of saroses described by Mrs. Todd and the sun's distances from the node, tabulated in Table IV-L. On the 1st May, A.D. 181 (46th completed day), when the series above studied began, the sun's distance from the node was, by Table IV-L, 341·78° minus ·25°, which is equal to 341·53 degrees. This is about the limiting distance for an eclipse of the sun, and we see from Mrs. Todd's description and our illustration that when the sun's distance from the node is at this limit, the penumbra is just beginning to touch the earth at the north pole. We know that after every 18 years and $10\frac{1}{2}$ days, the sun's distance from the node increases by ·4762 of a degree, and that since 30 degrees is almost exactly equal to 63 × ·4762°, it must be 63 saroses, that is 1,136 years, before the sun's distance from the node passes from 341·53 degrees, to 341·53 degrees *plus* 30 degrees, which is equal to 11·53 degrees, i.e., the distance will be 11·53 degrees in A.D. 181 *plus* 1136, which is equal to A.D. 1317, March 13 (Table II). On that day, being the 352nd day of the Indian solar year, A.D. 1316-17, the distance of the sun from the node was, by Table IV-L, 11·41 *plus* ·11 (vide head-lines of Table IV-L), which is equal to 11·52. just what we expected.

359. According to Mrs. Todd, if a new series of saroses began at the north pole about A.D. 180, the eclipse would acquire a central track near the pole about A.D. 380, it would cross the earth farther and farther from that pole for 750 years, and about A.D. 1138 it would have reached the other pole and cease to yield any eclipses after another 200 years. We have seen by actual investigation that a series of saroses beginning on 3rd May of A.D. 181, when the sun's distance from the node was 341·53 degrees, did yield an eclipse with a track near the north pole on 28th August 379 (164th day), when the sun's distance from node was, by Table IV-L (line of 14 A.D.), 346·79 degrees; that about 730 years after this date, that is on 15th November A.D. 1118 (236th day), when the sun's distance from the node was 6·39 degrees, the last eclipse of the series occurred near the south pole, and that in 200 years more, that is about A.D. 1317, the series ceased to yield any eclipses, although the sun's distance from the node was only 11·52 degrees. In fact we could have gone on for another 100 years before reaching anything like the distance of sun from node at which eclipses become uncertain: but the number of these imperceptible eclipses is really undetermined. Instead of Mrs. Todd's 1150 years, which is 64 saroses, another popular authority, *Chambers' Story of Eclipses* (Hodder and Stoughton, 1902), gives "70 saros or more than 1,200 years" for the total length of an eclipse series from pole to pole. In practice, it is well to remember (1) that the sun's distance from the node increases from 15 degrees *less* than 360 degrees, to 15 degrees *more than* 360 degrees in exactly 63 saroses, or 1,136 years less 56 days; (2) that in 613 years (tropical) the saros repeats itself nearly on the same day of the European or Julian calendar: for there were exactly 34 saroses of 18 years and 10·7 days each between A.D. 181, May 13, when our eclipse was fringing the north pole and 14th May, A.D. 812 when there was a total eclipse in the same series, central in 30 degrees north latitude when it was noon there, i.e., in the meridian of Paris; (3) that in 1226 tropical years (1226 Indian sidereal years less 5 days) there are exactly 68 saroses, which may be regarded as the total length of an eclipse series from pole to pole.

360. Given a particular solar eclipse, say, the very first one recorded in Table II, on 10th June A.D. 1, what, the reader may ask, was its place in the series of eclipses which we have supposed must have gone on uninterruptedly for 1,200 years and must have consisted of 63 to 70 saroses of 18 years and $10\frac{1}{2}$ days each? We cannot answer this question (if we do not use Table IV-L) except by following the tracks of the same eclipse through successive saroses with the aid of the French work or of Oppolzer. There are, absolutely, about 43 solar eclipses in the course of a saros of 18 years and $10\frac{1}{2}$ days. Each of these eclipses will have to be

followed through a period of about 900 years (as we did from the eclipse of June 3, A.D. 235 to the eclipse of November 15, A.D. 1118) before we can place a given eclipse in its proper position among the 60 odd eclipses of *its* series. When we have taken all this trouble, we shall still be in considerable doubt about the eclipses for the first two hundred and fifty and the last two hundred and fifty years of a series of seventy saroses.

361. It will be instructive, however, to follow, in the light of the above remarks, the history, as far as we can trace it through Table II, of the eclipses in the first saros of the Christian era (A.D. 1 to A.D. 18). We shall note in each case (1) whether the track of the eclipse advanced from the north pole to the south pole, or in the reverse direction; (2) the last eclipse in the series of saroses which is entered in Table IV-L; (3) the distance of the sun from the node, according to Table IV-L, at the last recorded eclipse in the series.

—	S. to N. pole;—last recorded eclipse.	S. to N. pole;—Distance of sun from node at last eclipse.	N. to S. pole;—last recorded eclipse.	N. to S. Pole;—Distance of sun from node at last eclipse.
		Degrees.		Degrees.
1. A.D 1, June 10	A.D. 506, Apr. 9	196·95	.....	...
2. A.D. 2, May 30	A.D. 705, July 25	193·92	.....	...
3. A.D. 2, Nov. 23	.....	...	A.D. 814, Mar. 24	12·77
4. A.D. 3, Nov. 12	.....	...	A.D. 959, June 8	8·53
5. A.D. 4, Apr. 8	A.D. 148. July 3	193·75	.....	...
6. A.D. 5, Mar. 28	A.D. 437, Dec. 13	193·44	.....	...
7. A D. 5, Sep. 21	.....	...	A.D. 402, May 18	8·38
8. A.D. 6, Sep. 11	.....	...	A.D. 637, Sep. 24	6·33
9. A.D. 7, Feb. 6	A.D. 97, Apr. 1	198·94	.....	...
10. A.D. 7, Aug. 31	A.D. 412, Apr. 27	195·21	.....	...
11. A.D. 8, Jan. 26	A.D. 242, June 15	194·40	.....	...
12. A.D. 9, July 10	.....	...	A.D. 568, June 10	11·41
13. A.D. 10, June 30	.....	...	A.D. 659, July 24	5·38
14. A.D. 10, Nov. 24	A.D. 101, Jan. 17	197·43	.....	...
15. A.D. 11, Nov. 14	A.D. 336, May 27	195·43	.....	...
16. A.D. 12, Nov. 2	A.D. 784, Jan. 10	197·99	.....	...
17. A.D. 13, Apr. 28	.....	...	A.D. 662, May 23	11·89
18. A.D. 14, Apr. 18	.....	...	A.D. 843, Aug. 29	8·86
19. A.D. 15, Sep. 2	A.D. 412, Apr. 27	195·91	.....	...
20 A.D. 16, Aug. 21	A.D. 647, Sep. 4	193·92	.....	...
21. A.D. 17, Feb. 15	.....	...	A.D. 648, Feb. 29	9·96
22. A.D. 18, Feb. 4	.....	...	A.D. 883, July 8	8·14
23. A.D. 18, July 1	A.D. 126, Sep. 4	194·94	.....	...

362. We notice first, with reference to the statements made in paragraphs 345 and 360 supra, that there were not anything like 43 solar eclipses in this saros, A.D. 1 to A.D. 18; for there were only 23 eclipses actually registered and even among these 23, we have been obliged to include one or two which are not found actually registered, but which we have every reason to suppose occurred near either pole, particularly the south pole. Secondly, we notice that in all the eclipses travelling from the north to the south pole, the distances of the sun from the node range about 360°; whereas in the eclipses travelling from the south to the south pole, the distances of the sun from the node range about 180°. This is

an important practical deduction. Thirdly, we notice, that while the distance of the sun from the node, in the case of eclipses travelling from the south to the north pole, reaches the theoretical limit of 199° (vide paragraph 330 supra), the distance of the sun from the node in the case of eclipses travelling in the opposite direction scarcely reaches 10°.

363. The third observation made in the last paragraph is the one that most concerns us in chronology. The eclipses that most interest us in chronology are those recorded in the northern, or the *land* hemisphere of the earth, as it was known up to the 16th century A.D. For until A.D. 1492, the date of the discovery of America, the nations that have recorded historical or chronological events were practically unacquainted with any country south of the equator, whereas they were acquainted with countries up to within 40° of the north pole. If we graph the observations made in paragraphs 351 to 355 supra, and apply to eclipses with tracks south of the equator what is there said about eclipses whose central tracks are in northern latitudes, we shall find that for an eclipse to be visible as far north as the tenth degree of northern latitude (the latitude of Madura), the central track, south of the equator, should not be below the twentieth degree of south latitude ; whereas an eclipse whose central track is near the north pole will be visible as we have seen, in France. Therefore, in chronological investigations, we take into account all eclipses whose central tracks are between the north pole and 20 degrees south of the equator, and eclipses whose central tracks are between the twentieth degree of south latitude and the south pole are neglected. If we suppose the whole course of an eclipse to be 180°, from the north to the south pole, or vice versâ, we neglect a third of the track which begins, or ends, with the south pole.

364. A solar eclipse can take place as long as the sun at the time of new moon is not more than 19° removed from a node. In the above list of eclipses belonging to the first saros in the Christian era, A.D. 1 to A.D. 19, we see four eclipses ending with the north pole, in which the extreme distance of the sun from node was 17°, 18° or 19° ; whereas, in the case of eclipses travelling from the north to the south pole, the extreme distance of the sun from the node at any recorded eclipse reached nearly 13° in only one case, and in most cases was less than 9°, and there are no eclipses corresponding to the last 10°, or a third of the arc of 30° (15° on either side of each node, between which limits, according to paragraph 330 supra, the sun is to be found during a solar eclipse). The reason is not that there was no eclipse when the sun was between 9° and 19° distant from a node, but that the central track of such eclipses was so far south of the equator that the eclipses could not have been observed as such any where north of the equator. Among eclipses beginning at the north pole, we have a few cases on record, where the distance of the mean sun from the node was at the extreme limit of 341·1°, or even a little beyond, the sun's distance from the node at which an eclipse is ordinarily possible. Such cases are the following :—

340·74° (A.D. 1682, 147th completed day = August 22.

(*N.B.*—By Table IV-C sun's anomaly on 147th day would bring the sun 2° nearer the node.)

341·78°. A.D. 7, 564, 622, 1045, 1237, 1660, 1718.
341·22°. A.D. 470, 662, 1027, 1143.

Beyond 342°, solar eclipses became fairly frequent; and they become more frequent as the distance of the sun from the node approaches 360° or 0°. When the sun's distance from the node is between 0° and 5°, the number of eclipses is still frequent but in the neighbourhood of 7°, the recorded eclipses are few, and confined to those visible in India ; see the lines against 7·35° (A.D. 58), 6·87° (A.D. 40), 7·91° (A.D. 18), 6·39° (A.D. 22). When the sun's distance from the node is about 9°, and a *fortiori* when it is more than 9°,there are practically no eclipses in our record (Table IV-L.), for the reason already investigated, viz., that chronology does not take account of eclipses which are visible only in southern latitudes. Of course an eclipse which is central in southern latitudes may be visible in Northern latitudes (vide paragraph 354 supra).

365. Conversely, in the case of eclipses whose tracks gradually advance northwards, beginning at the South Pole and ending at the North Pole, and which are indicated by the sun's distance from the node being within 19 degrees on either side of 180°, we find that eclipses near the South Pole, when the sun's distance from the node is between 161° and 171°, are either not represented at all in Table IV-L or are represented (towards the end of this limit) by eclipses visible only in South-East Asia (including India). Above 170° and up to 197°, we have the largest number of recorded and observed solar eclipses, and we lose count of their tracks only when they have reached the North Pole. These are important indications which will guide us in the investigation of ancient eclipses.

We subjoin tables showing the daily and yearly joint motions of the sun and node (1) from 1 to 99 days, and (2) from 1 to 20 years. It will, however, seldom be necessary to refer to these tables because the exact distance of the mean sun from the node at any new moon or full moon, at which an eclipse could possibly occur, in times ancient or modern, can always be ascertained at a glance from column 1 of Table IV-L, the cycle of 1711 years being used when necessary.

(1) *Joint motion of sun and node from* 1 *to* 99 *days.*

Days.	Degrees.	Days.	Degrees.	Days.	Degrees.
1	1°. 0386	34	35°. 3124	67	69°. 5863
2	2°. 0772	35	36°. 3510	68	70°. 6249
3	3°. 1158	36	37°. 3897	69	71°. 6635
4	4°. 1544	37	38°. 4283	70	72°. 7021
5	5°. 1930	38	39°. 4669	71	73°. 7407
6	6°. 2316	39	40°. 5055	72	74°. 7793
7	7°. 2702	40	41°. 5441	73	75°. 8179
8	8°. 3088	41	42°. 5827	74	76°. 8565
9	9°. 3474	42	43°. 6213	75	77°. 8951
10	10°. 3860	43	44°. 6599	76	78°. 9337
11	11°. 4246	44	45°. 6985	77	79°. 9723
12	12°. 4632	45	46°. 7371	78	81°. 0109
13	13°. 5018	46	47°. 7757	79	82°. 0495
14	14°. 5404	47	48°. 8153	80	83°. 0881
15	15°. 5790	48	49°. 8529	81	84°. 1267
16	16°. 6176	49	50°. 8915	82	85°. 1653
17	17°. 6562	50	51°. 9301	83	86°. 2039
18	18°. 6948	51	52°. 9687	84	87°. 2425
19	19°. 7334	52	54°. 0073	85	88°. 2811
20	20°. 7720	53	55°. 0459	86	89° 3197
21	21°. 8106	54	56°. 0845	87	90°. 3583
22	22°. 8492	55	57°. 1231	88	91°. 3969
23	23°. 8878	56	58°. 1617	89	92°. 4355
24	24°. 9264	57	59°. 2003	90	93°. 4741
25	25° 9650	58	60°. 2389	91	94°. 5127
26	27°. 0036	59	61°. 2795	92	95°. 5513
27	28°. 0422	60	62°. 3161	93	96°. 5899
28	29°. 0808	61	63°. 3547	94	97°. 6285
29	30°. 1194	62	64° 3933	95	98°. 6671
30	31°. 1580	63	65°. 4319	96	99°. 7057
31	32°. 1966	64	66°. 4705	97	100°. 7443
32	33°. 2352	65	67°. 5091	98	101°. 7829
33	34°. 2738	66	68°. 5477	99	102°. 8215

(2) *Joint motion of sun and node from* 1 *to* 20 *years.*

Years.	Degrees.	Years.	Degrees.	Years.	Degrees.
1	19°. 3582558	8	154°. 8660464	15	290°. 3738374
2	38°. 7165116	9	174°. 2243022	16	309°. 7320932
3	58°. 0747674	10	193° 5825584	17	329°. 0903490
4	77°. 4330232	11	212°. 9408142	18	348°. 4486048
5	96°. 7912790	12	232°. 2990700	19	7°. 8068606
6	116°. 1495348	13	251°. 6573258	20	27°. 1651164
7	135°. 5077906	14	271°. 0155816		

TABLES

EYE-TABLES.

SŪRYA SIDDHĀNTA EYE-TABLE—Specimen problems.

This Eye-table **alone** will enable any one to solve correctly, to four decimal places of a day, and by a single operation, any problem in solar dates, nakshatras, or week-days, for 5,100 years, i.e., from B.C. 3102 to A.D. 1999. The tables of equations are given to two places of decimals in the abridged sections **e** to **i** of the Eye-table—see next page—and to four places of decimals in the unabridged sections **e** to **i**, pages 171 to 188 below.

The computation of the ending moment, whether of a tithi, a nakshatra, or a yoga, always comprises four processes: (1) to find the mean ending moment, (2) to find the anomaly or anomalies for that moment, (3) to find the equation or equations corresponding to the anomaly or anomalies, and (4) to add together the mean ending moment and the equation or equations.

Problem I.—Required to find the ending moment, by Sūrya siddhānta, *of Āshāḍha Śukla 12, A.D. 484.* Note stages **(1)** to **(10)**.

Commencement of solar year. Col. 1.	Days of solar year and sun's anomaly in days of S. Yr. Col. 2.	Moon's anomaly. Col. 3.
A.D. 400 ... ... Mar. 17·48569 **k**		
84 years ... ·73554 **n**		
A.D. 484–5 ... Mar. 18·22123 **(1)**		
N.B.—This, by itself, is a valuable piece of information, giving the English year, month, day and fraction of day on which a particular Indian solar year between 3102 B.C. and A.D. 2000 commenced, and it may be had in a few seconds from the Eye-table, sections **k** and **n** for any one of 5,100 years.		
	First new moon in solar year. { A.D. 400 ... 23·84466 **l**; 84 years 0·54583 **o**; A.D. 484 ... 24·38999 **(2)**	21·75228 **m**; 13·46585 **p**; 24·38999 **(2)** (1st N.M. in solar year).
		59·60812
		−55·1090 **d** (2 anom. months).
		4·4991 **(3)** (☾'s An. at 1st N.M. in S. Yr.)
	Add for Āshāḍha new moon .. 59·0612 **b**	... 3·952 **c**
	Do. 12 tithis ... ... 11·8122 **d**	...11·812 **d**
	95·2634 **(4)**	20·263
		−·045 (☉'s equation—**h**).
Note how stages **(1)**, **(2)**, **(3)**, **(4)**, **(5)**, **(6)**, **(7)** and **(8)** are successively arrived at with the help of the Eye-table and then add together **(4)**, **(8)** and **(1)**, as shown in column 2.		20·218 **(5)**
	Sum of ☉'s and ☾'s eqns. (col. 3) ... ... + ·3685 **(8)**	☉'s eqn. for An. of 95·26 d. **(4)** ... − ·0453 **h** **(6)**
	95·6319	☾'s eqn. for An. of 20·918 d. **(5)**... + ·4138 **e** **(7)**
	Add commencement of solar year A.D. 484-5. Mar. 18·2212 **(1)**	Sum of ☉'s and ☾'s eqns. + ·3685 **(8)**
	Mar. 113·8531 **(9)**	

We reach, for the ending moment of the tithi, the result, March 113·8531 **(9)**. By Eye-table **q**, the 93rd day from March 1 is June 1.

∴ The 113th day from March 1 is June 1 + 20 = June 21 ... **q**; and by Eye-table **r**, ·8500 of a day = 51 ghaṭikas and ·0031 day = 11 palas ... **(10)**.

For the week-day, we have, for 21 June A.D. 484, by Eye-table **j**, 2 + 0 + 3 + 21 = 26; 26 ÷ 7 leaves remainder 5, i.e., Thursday.

∴ The ending moment of the tithi was 51 ghaṭikas 11 palas after mean sunrise, on Thursday, 21 June A.D. 484 which is identical with the result reached by Mr. Dikshit in the *Introduction to Dr. Fleet's Gupta Inscriptions*, p. 157 .. ... **(10)**.

Problem II.—Problem I worked to four places of decimals, with the aid of table II and Eye-tables **y**, **e** *and* **h**.

N.B.—The above problem can be worked in a much shorter time with the additional help of Eye-table **y** (p. 158) and Table II (p. 218).

	Days of S. Yr. and sun's anomaly.	Moon's mean anomaly in days.
Table II. First new moon in solar year A.D. 484–85	... 24·3900	... ... 4·498
Eye-table **y**. Āshāḍha Śu. 12	... 70·8734	... ... 15·764
	95·2634	20·262
Eye-table **h**. ☉'s eqn. for anomaly of 95·26 days	− ·0453	☉'s eqn. − ·0453
Eye-table **e**. ☾'s eqn. for anomaly of 20·216 days	+ ·4138	20·216
	+ ·3685	
	... + ·3685	
	95·6319	
Add English month and day, marking commencement of Indian solar year A.D. 484–5 (Table II)	Mar. 18·2212	
	Mar. 113·8531 = June 21, A.D. 484, 50 ghaṭikas 11 palas after mean sunrise (Eye-tables **q** and **r**).	

Same problem.—**The shortest method,** and the one ordinarily recommended. In general, it will be quite enough to obtain a result correct to two places of decimals, as in the Ephemeris, and this of course will take less time.

			Moon's anomaly in days.
Table II. New moon tithi, Āshāḍha, A.D. 484-85	**(7)** June 9·67	Table II. 1st N.M. in S. Yr. A.D. 484-85... Days. 24·39	An. of 1st N.M. in S. Yr. 4·50
Eye-table **d**. *Add* for 12 tithis...	... .. 11·81	Eye-table **y**. *Add* for Āshāḍha Śu. 12 ... 70·87	... ... 15·76
	(19) June 21·48	95·26	20·26
		Eye-table **h**. ☉'s eqn. for An. of 95·26 days ... ... − ·04	→ → − ·04
	+ ·37	☾'s eqn. for An. of 20·22 d. = ... + ·41	20·22
	(**19**) June 21·85, i.e., Thursday, 21st June, A.D. 484 at ·85 of day.	← ← ... ... + ·37	

• *N.B.*—This **(7)** is the week-day, Saturday, to which we add 12, since the days of June, 9, are increased by 12 when 12 tithis or 11·81 days are added. Resulting week-day, 19, i.e., 19 ÷ 7 which leaves remainder 5, or Thursday.

Problem III.—Required the ending moment of nakshatra **Anurādhā** (No. 17) *in June, A.D. 484.*

N.B.—We do not require ☉'s An. for this (see paragraph 97, p. 33 of Text).

		Moon's anomaly in days.
Table II. Ending moment mean of new moon tithi, Āshāḍha, A.D. 484	**(7)** June 9·67	
Anomaly of Āshāḍha N.M., i.e., An. at 1st N.M. in S. year, 4·50 (Table II) + 3·95 [addn. for Āshāḍha N.M. by Eye-table **c**]	... ...	... ... 8·45
Eye-table **s**. Shortest interval from Āshāḍha N.M. to No. 17 Anurādha nakshatra ...	... ... 10·74	... ... 10·74
Eye-tables **t**, **u**. Nak. corrn. for 1st N.M. in S. year, 24·39 d., i.e., corrn. for 24 days, +0·41 **(t)** *less* corrn. for ·39 day, ·03 **(u)**; Total correction	... ... + 0·38	→ → ... + 0·38
Eye-table **f**. ☾'s nak. eqn. for anomaly of 19·57 d. (last col.) ...	... ... + ·38	19·57
	(**19**) June 21·17, i.e., Thursday, 21st June, at ·17 of day.	

Problem IV.—Required the ending moment of yoga **Śukla** (No. 24) *in June A.D. 484. N.B.*—We require sun's anomaly for yogas, v. p. 36.

		Sun's anomaly in days, and sun's and moon's equations.	Moon's anomaly in days.
Table II. Ending moment of mean new moon tithi, Āshāḍha, A.D. 484–85	**(7)** June 9·67	1st N.M. in S.Y. ... 24·39	☾'s An. at 1st N.M., S.Y. 4·50
Eye-tables **b** and **c**	...	*Add* for Āshāḍha N.M. 50·06	... ... 3·95
Eye-table **v**. Shortest interval from Āshāḍha N.M. to yoga No. 24, Śukla	... ... 10·57	... ... 10·57	... ... 10·57
Eye-tables **w**, **x**. Yoga corrn. for 1st N.M. in S.Y., i.e., corrn. for 24 days, 0·77 **(w)** *less* corrn. for ·39 day, ·05 **(x)**	.. ... 0·72	.. .. 0·72	... ... 0·72
		94·74	19·74
Eye-table **i**. Sun's yoga eqn. for An. of 94·74 days (col. 2)	...	... ... + ·04	→ → ... + 0·04
Eye-table **g**. Moon's yoga eqn. for An. of 19·78 days (last col.)	... ...	... ... + ·35	19·78

EYE-TABLE FOR

NOTE.—The different parts of this Table are lettered in order from a to y and All the figures, except where otherwise indicated,

a Order of signs of zodiac or rāśis and ☉'s longitude at commencement	1...0°	2...30°	3...60°	4...90°
Bengal solar months	Vaiśākha.	Jyeshṭha	Āshāḍha	Śrāvaṇa
Tamil and Malayālam solar months; also names of rāśis	Mēsha	Vṛishabha	Mithuna	Karkaṭāka
Tamil solar months	Chittirai	Vaigāśi	Āni	Āḍi
Moment of sankrānti in days of solar year, and decimals of a day	0·0	30·9353	62·3556	94·0003
English date corresponding to each sankrānti (A.D. 1911)	Apr. 13	May 14	June 14	July 16
Lunar month: each month commences *before* sankrānti noted in *next* column	(1) *Vaiśākha*	(2) *Jyeshṭha*	(3) *Āshāḍha*	(4) *Śrāvaṇa*
b Increase in days, (1) of lunar months, (2) of sun's anomaly	0·000	29·5306	59·0612	88·5918
c " of ☾'s An. when interval between Mesha sank. and 1st N.M. in sol. yr. is 0·00 day.	0·000	1·976	3·952	5·928

Tithi equivalents in days and

d Tithi equivalent in days ... ...

1	2	3	4	5
·9843	1·9687	2·9531	3·9374	4·9218
16	**17**	**18**	**19**	**20**
15·7496	16·7340	17·7182	18·7027	19·6871

e, f, g Moon's equation of the centre and moon's anomaly in days and

	·00	·01	·02	·03	·04	·05	·06	·07	·08	·09	·10	·11	·12	·13	·14	·15	·16	·17	·18	·19	·20
−	·00	·11	·23	·34	·46	·58	·69	·81	·93	1·04	1·16	1·28	1·40	1·52	1·64	1·77	1·89	2·02	2·14	2·27	2·40
−	13·78	13·68	13·59	13·49	13·40	13·30	13·20	13·11	13·01	12·91	12·81	12·71	12·61	12·51	12·41	12·31	12·20	12·10	11·99	11·88	11·77
+	13·78	13·87	13·97	14·06	14·16	14·25	14·35	14·45	14·54	14·64	14·74	14·84	14·94	15·04	15·14	15·24	15·35	15·45	15·56	15·67	15·78
+	27·55	27·44	27·32	27·21	27·09	26·98	26·86	26·74	26·63	26·51	26·39	26·27	26·15	26·03	25·91	25·79	25·66	25·54	25·41	25·28	25·15
−	0·00	0·12	0·25	0·37	0·50	0·62	0·74	0·87	1·00	1·12	1·25	1·38	1·51	1·64	1·77	1·90	2·04	2·18	2·32	2·46	2·60
−	13·78	13·67	13·57	13·46	13·36	13·26	13·15	13·05	12·94	12·83	12·72	12·62	12·51	12·40	12·28	12·17	12·06	11·94	11·82	11·70	11·58
+	13·78	13·88	13·98	14·09	14·19	14·30	14·40	14·51	14·61	14·72	14·83	14·91	15·05	15·16	15·27	15·38	15·50	15·61	15·73	15·85	15·98
+	27·55	27·43	27·31	27·18	27·06	26·93	26·81	26·68	26·56	26·43	26·30	26·17	26·04	25·91	25·78	25·65	25·51	25·38	25·24	25·10	24·95
−	0·00	0·13	0·26	0·40	0·53	0·66	0·79	0·93	1·07	1·20	1·34	1·48	1·62	1·76	1·90	2·05	2·19	2·34	2·49	2·65	2·80
−	13·78	13·66	13·55	13·44	13·33	13·22	13·10	12·99	12·87	12·75	12·64	12·52	12·40	12·28	12·15	12·03	11·90	11·78	11·64	11·51	11·37
+	13·78	13·89	14·00	14·12	14·23	14·34	14·45	14·57	14·68	14·80	14·91	15·03	15·15	15·27	15·40	15·51	15·65	15·78	15·91	16·04	16·18
+	27·55	27·42	27·29	27·16	27·02	26·89	26·76	26·62	26·49	26·35	26·21	26·08	25·94	25·79	25·65	25·51	25·36	25·21	25·06	25·91	25·75

h For tithis. Sun's equation of the centre and sun's anomaly in days of the solar

+ ·18	+ ·175	+ ·17	+ ·16	+ ·15	+ ·14	+ ·13	+ ·12	+ ·11	+ ·10	+ ·09	+ ·08	+ ·07	+ ·06	+ ·05	+ ·04	+ ·03	+ ·02
358	0	7	16	23	28	33	38	42	46	50	54	57	61	64	68	71	74
354	343	334	327	321	315	310	305·5	301	297	293	289	286	283	279	276	273	269·5

i For yogas.—Sun's equation	**−·154**	**−·153**	**−·15**	**−·14**	**−·13**	**−·12**	**−·11**	**−·10**	**−·09**	**−·08**	**−·07**	**−·06**	**−·05**	**−·04**	**−·03**
Anomaly in days of solar year	355·91	360	2	14	22	29	35	40	45	49	53	58	62	66	69
	354·64	350	342	330	322	315	309	304	299	295	290	286	282	278	274

j Perpetual almanac for European calendar.

[*N.B.*—Heavy type means week-day, Sunday being **1**, Monday **2**, etc.]

Centuries B.C.

1	2	3	4	5	6	7 or 0
3001	3101	3201				
2301	2401	2501	2601	2701	2801	2901
1601	1701	1801	1901	2001	2101	2201
901	1001	1101	1201	1301	1401	1501
201	301	401	501	601	701	801
					1	101

N.B. B.C. years should be made positive thus: B.C. 41 is 57th year of century beginning with 101 B.C.—see p. 13 of Text.

Centuries A.D. old style.

500	400	300	200	100	0
1200	1100	1000	900	800	700	600
		1700	1600	1500	1400	1300

Centuries A.D. new style.

1600	1900	1800	1700	
2000	2300	2200	2100	

N.B.—Old Style ceased in continental countries (exc. Russia) on 4-10-1582 and New Style began on 15-10-1582, 10 days being dropped. In United Kingdom, New Style began on 14-9-1752, 11 days being dropped.

Odd years in a century.

1	2	3	4	5	6	7 or 0
1	2	3	..	4	5	6
7	...	8	9	10	11	...
12	13	14	15	..	16	17
18	19	...	20	21	22	23
...	24	25	26	27	...	28
29	30	31	...	32	33	34
35	...	36	37	38	39	...
40	41	42	43	...	44	45
46	47	...	48	49	50	51

1	2	3	4	5	6	7 or 0
...	52	53	54	55	...	56
57	58	59	...	60	61	62
63	...	64	65	66	67	...
68	69	70	71	...	72	73
74	75	...	76	77	78	79
..	80	81	82	83	..	84
85	86	87	...	88	89	90
91	...	92	93	94	95	...
96	97	98	99	...	...	...

Months in

	1	2	3	4	5	6	7 or 0
Ordinary years	Aug.	Feb. Mar. Nov.	June	Sep. Dec.	Apr. July	Jan. Oct.	May
Leap years	... Feb.	...	...	...	Jan.	...	...

[*Example.—To find week-day of 26th Jan. 1844—*
Add 4 + 6 + 5 + 26 and divide the total 41 by 7. Remainder, 6 = Friday.]

Sūrya siddhānta constant

Year B.C. or A.D.	Kaliyuga.	Commencement of solar year, month and date.	Fraction of day.	First new moon in solar year.	☾'s anomaly at commencement of solar year.
B.C.		**k**		**l**	**m**
3201	99	Feb. 14	·93235	17·34738	23·29084
3102	0	Feb. 15	·57924	2·17013	4·71797
3101	1	Feb. 15	·83800	20·80902	11·76692
3001	101	Feb. 16	·71365	24·27066	0·24311
2901	201	Feb. 17	·58930	27·73230	16·27388
2801	301	Feb. 18	·46494	1·60335	4·75007
2701	401	Feb. 19	·34059	5·12499	20·78084
2601	501	Feb. 20	·21624	8·58663	9·25703
2501	601	Feb 21	·09189	12·04827	25·28780
2401	701	Feb. 21	·96754	15·50891	13·76393
2301	801	Feb. 22	·84319	18·97155	2·24018
2201	901	Feb. 23	·71883	22·43319	18·27095
2101	1001	Feb. 24	·59448	25·89483	6·74714
2001	1101	Feb. 25	·47013	29·35647	22·77791
1901	1201	Feb. 26	·34578	3·28752	11·25410
1801	1301	Feb. 27	·22143	6·74916	27·28487
1701	1401	Feb. 28	·09708	10·21080	15·76106
1601	1501	Feb. 28	·97273	13·67244	1·23725
1501	1601	Feb. 29	·84837	17·13408	20·26802
1401	1701	Mar. 1	·72402	20·59572	8·74421
1301	1801	Mar. 2	·59967	24·05736	24·77498
1201	1901	Mar. 3	·47532	27·51900	13·25114
1101	2001	Mar. 4	·35097	1·45005	1·72736

Year B.C. or A.D.	Kaliyuga.	Commencement of solar year, month and date.
B.C.		**k**
1001	2101	Mar. 5
901	2201	Mar. 6
801	2301	Mar. 6
701	2401	Mar. 7
601	2501	Mar. 8
501	2601	Mar. 9
401	2701	Mar. 10
301	2801	Mar. 11
201	2901	Mar. 12
101	3001	Mar. 13
1	3101	Mar. 13
A.D.		
100	3201	Mar. 14
200	3301	Mar. 15
300	3401	Mar. 16
400	3501	Mar. 17
500	3601	Mar. 18
600	3701	Mar. 19
700	3801	Mar. 20
800	3901	Mar. 20
900	4001	Mar. 21
1000	4101	Mar. 22
1100	4201	Mar. 23
1200	4301	Mar. 24
1300	4401	Mar. 25
1400	4501	Mar. 26
1500	4601	Mar. 27
1600	4701	Mar. 27
1700	4801	Mar. 28
1800	4901	Apr. 10
1900	5001	Apr. 12

N.B.—Odd years in centuries B.C. should be converted into positive years before adding **n, o** or **p** to **k, l, m**. See examples on pages 118, 119.

the way in which they are to be used is shown in the specimen problems on reverse.

5 ..120°	6...150°	7...180°	8...210°	9...240°	10...270°	11...300°	12...330°	
Bhādrapada	Āśvina	Kārttika	Mārgaśirsha	Pausha	Māgha	Phālguna	Chaitra	
Siṁha	Kanyā	Tulā	Vṛiśchika	Dhanus	Makara	Kumbha	Mīna	——
Āvaṇi	Puraṭṭāśi	Aippasi	Kārttigai	Mārgaḷi	Tai	Māśi	Paṅguni	
125·4756	156·4942	186·9356	216·8289	246·3192	275·6369	305·0850	334·9053	365·2588
Aug. 16	Sep. 16	Oct. 17	Nov. 16	Dec. 15	Jan. 14	Feb. 12	Mar. 13	
(5) Bhādrapada	*(6) Āśvina*	*(7) Kārttika*	*(8) Mārgaśīrsha*	*(9) Pausha*	*(10) Māgha*	*(11) Phālguna*	*(12) Chaitra*	*(13) Chaitra when there is adhikamasa.*
118·1223	147·6530	177·1835	206·7141	236·2447	265·7753	295·3059	324·8365	354·3570
7·904	9·880	11·856	13·832	15·808	17·784	19·760	21·736	23·712

decimals of a day, and moon's anomalistic months.

6	7	8	9	10	11	12	13	14	15
5·9061	6·8905	7·8718	8·8592	9·8435	10·8379	11·8122	12·7966	13·7809	14·7653
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
20·6714	21·6558	22·6401	23·6245	24·6988	25·5932	26·5775	27·5619	28·5462	29·5306

Moon's anomalistic months.

1 month = 27·5545 days.
2 months = 55·1090 days.
12 months = 330·6540.
13 months = 358·2085.

decimals of a day. (The signs − and + are to be applied to the equation in heavy type and not to the anomaly.)

·21	·22	·23	·24	·25	·26	·27	·28	·29	·30	·31	·32	·33	·34	·35	·36	·37	·38	·39	·40	·41	
2·53	2·67	2·80	2·94	3·08	3·23	3·38	3·53	3·69	3·85	4·01	4·19	4·37	4·56	4·76	4·98	5·21	5·48	5·78	6·14	6·70	
11·66	11·55	11·43	11·31	11·19	11·07	10·94	10·81	10·67	10·53	10·38	10·23	10·07	9·90	9·71	9·51	9·30	9·06	8·78	8·43	7·90	e For tithis.
15·89	16·00	16·12	16·24	16·36	16·49	16·61	16·75	16·88	17·03	17·17	17·33	17·49	17·66	17·84	18·03	18·25	18·49	18·77	19·12	19·65	
25·02	24·89	24·75	24·61	24·47	24·32	24·18	24·02	23·87	23·73	23·54	23·36	23·18	22·99	22·79	22·58	22·34	22·08	21·73	21·41	20·86	
2·74	2·89	3·04	3·20	3·36	3·52	3·69	3·87	4·05	4·24	4·44	4·65	4·88	5·13	5·40	5·72	6·11	6·73				
11·45	11·32	11·19	11·05	10·92	10·77	10·62	10·47	10·31	10·14	9·95	9·77	9·56	9·33	9·07	8·78	8·41	7·81				f For nakshatras.
16·10	16·23	16·36	16·50	16·64	16·78	16·93	17·09	17·25	17·42	17·60	17·79	18·00	18·22	18·48	18·78	19·15	19·74				
24·81	24·66	24·51	24·35	24·19	24·03	23·86	23·68	23·50	23·32	23·11	22·90	22·68	22·13	22·15	21·83	21·44	20·83				
2·96	3·13	3·30	3·47	3·65	3·84	4·03	4·24	4·46	4·68	4·93	5·20	5·52	5·90	6·42							
11·23	11·09	10·94	10·78	10·62	10·45	10·28	9·10	9·90	9·69	9·46	9·21	8·92	8·56	8·06							g For yogas
16·32	16·46	16·61	16·77	16·93	17·10	17·27	77·46	17·67	17·86	18·09	18·34	18·63	18·99	19·49							
25·59	24·43	24·26	24·08	23·90	23·71	23·52	23·31	23·09	22·87	22·62	22·35	22·04	21·66	21·16							

year and decimals of a day. (The anomalies are entered in ordinary type and the equations, with appropriate signs, in heavy type.)

+ ·01	·00	−·01	−·02	−·03	−·04	−·05	−·06	−·07	−·08	−·09	−·10	−·11	−·12	−·13	−·14	−·15	−·16	−·17	−·175	−·18
77	80·5	84	87	90	93·5	97	100	103	107	111	115	119	123	128	132	138	145	154	160	168
266	263	260	257	254	250	247	244	240	237	233	229	225	221	216	211	206	199	190	183	176
−·02	**−·01**	**−·00**	**+·01**	**+·02**	**+·03**	**+·04**	**+·05**	**+·06**	**+·07**	**+·08**	**+·09**	**+·10**	**+·11**	**+·12**	**+·13**	**+·14**	**+·15**	**+·153**	**+·154**	
73	77	80·55	84	88	92	96	99	103	108	112	116	121	126	132	139	147	159	167	171·71	
271	267	263·18	259	256	252	248	244	240	236	232	227	222	217	211	205	197	185	177	171·71	

for centuries.

Fraction of day.	First new moon in solar year.	☽'s anomaly at commencement of solar year.
	l	m
·22662	4·91229	17·75813
·10223	8·37393	6·23432
·97791	11·83557	22·26509
·85356	15·29721	10·74128
·72921	18·75885	26·77205
·60486	22·22049	15·24824
·48051	25·68213	3·72443
·35615	29·14377	19·75520
23180	3·07482	8·23139
·10745	6·53646	24·26216
·98310	9·99810	12·73835
·85875	13·45974	1·21454
73440	16·92138	17·24532
·61004	20·38302	5·72151
·48569	23·84466	21·75228
·36134	27·30630	10·22845
·23698	1·23735	26·25922
·11264	4·69899	14·73539
98828	8·16063	3·21156
·86393	11·62227	19·24233
73958	15·08391	7·71850
·61523	18·54556	23·74927
·49088	22·00720	12·22544
·36652	25·46884	0·70161
·24217	28·93048	16·73238
·11782	2·85153	5·20855
·99347	6·32317	21·35937
·86912	9·78481	9·83810
·74477	13·24645	25·87144
·62041	16·70809	14·35017

Sūrya siddhānta—Odd years.

	Fraction of day, marking commencement of solar year.	First new moon in solar year.	☽'s anomaly for beginning of solar year.
	n	o	p
1	·25876	18·63889	7·04896
2	·51751	7·74719	14·09791
3	·77627	26·38607	21·14687
4	·03502	15·49437	0·64123
5	·29378	4·60267	7·69019
6	·55254	23·24156	14·73915
7	·81129	12·34986	21·78810
8	·07005	1·45815	1·28246
9	·32881	20·09704	8·33142
10	·58756	9·20534	15·38038
11	·84632	27·84423	22·42933
12	·10508	16·95253	1·92369
13	·36383	6·06082	8·97265
14	·62259	24·69971	16·02161
15	·88135	13·80801	23·07057
16	·14010	2·91631	2·56492
17	·39886	21·55520	9·61388
18	·65761	10·66350	16·66284
19	·91637	29·30238	23·71180
20	·17513	18·41068	3·20615
21	·43388	7·51898	10·25511
22	·69264	26·15787	17·30407
23	·95140	15·26616	24·35303
24	·21015	4·37446	3·84739
25	·46891	23·01335	10·89634
26	·72767	12·12165	17·94530
27	·98642	1·22995	24·99426
28	·24518	19·86884	4·48862
29	·50393	8·97713	11·53757
30	·76269	27·61602	18·58653
31	1·02145	16·72432	25·63549
32	·28020	5·83262	5·12985
33	·53896	24·47151	12·17881
34	·79772	13·57981	19·22776
35	1·05647	2·68810	26·27672
36	·31523	21·32639	5·77108
37	·57399	10·43529	12·82004
38	·83274	29·07418	19·86899
39	1·09150	18·18247	26·91795
40	·35026	7·29077	6·41231
41	·60901	25·92966	13·46127
42	·86777	15·03796	20·51022
43	1·12652	4·14626	0·00458
44	·38528	22·78515	7·05354
45	·64404	11·89344	14·10250
46	·90279	1·00174	21·15146
47	1·16155	19·64063	0·64581
48	·42031	8·74893	7·69477
49	·67906	27·38782	14·74373
50	·93782	16·49611	21·79269
51	1·19658	5·60441	1·28704
52	·45533	24·24330	8·33600
53	·71409	13·35160	15·38496
54	·97284	2·45990	22·43392
55	1·23160	21·09878	1·92828
56	·49036	10·20708	8·97723
57	·74911	28·84597	16·02619
58	1·00787	17·95420	23·07515
59	1·26663	7·06257	2·56951
60	·52538	25·70146	9·61846
61	·78414	14·80976	16·66742
62	1·04290	3·91805	23·71638
63	1·30165	22·55694	3·21074
64	·56041	11·66524	10·25970
65	·81917	0·77354	17·30865
66	1·07792	19·41242	24·35761
67	1·33668	8·52073	3·85197
68	·59543	27·15961	10·90093
69	·85419	16·26791	17·94988
70	1·11295	5·37621	24·99884
71	1·37170	24·01509	4·49320
72	·63046	13·12339	11·54216
73	·88922	2·23169	18·59112
74	1·14797	20·87058	25·64007
75	1·40673	9·97888	5·13443
76	·66549	28·61776	12·18339
77	·92424	17·72606	19·23235
78	1·18300	6·83436	26·28130
79	1·44176	25·47325	5·77566
80	·70051	14·58155	12·82462
81	·95927	3·68985	19·87358
82	1·21802	22·32873	26·92253
83	1·47678	11·43703	6·41689
84	·73554	0·54533	13·46585
85	·99430	19·18422	20·51481
86	1·25305	8·29252	0·00917
87	1·51181	26·93140	7·05812
88	·77056	16·03970	14·10708
89	1·02932	5·14800	21·15604
90	1·28808	23·78689	0·65040
91	1·54683	12·89519	7·69935
92	·80559	2·00349	14·74831
93	1·06434	20·64237	21·79727
94	1·32310	9·75067	1·29163
95	1·58186	28·38956	8·34059
96	·84061	17·49786	15·38954
97	1·09937	6·60616	22·43850
98	1·35813	25·24504	1·93286
99	1·61688	14·35334	8·98182
100	·87565	3·46164	16·03078
200	·75130	6·92328	4·50696
300	·62694	10·38492	20·53775
400	·50259	13·84657	9·01393
500	·37824	17·30821	25·04471
600	·25389	20·76985	13·52089
700	·12954	24·23149	1·99708
800	·00519	27·69312	18·02786
900	·88084	1·62418	6·50404
1000	·75648	5·08582	23·53482
2000	·51297	10·17164	17·51504
3000	·26945	15·25746	12·49527

q Days counted from March 1

March	Mar. 1 ... 1	Apr. 1 32	May 1 62	June 1 93	July 1 123	Aug. 1 154	Sep. 1 185	Oct. 1 215	Nov. 1 246	Dec. 1 276	Jan. 1 307	Feb. 1 338	Mar. 1 ...	
r Ghaṭikas ...	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Fraction of day ...	·0167	·0333	·0500	·0667	·0833	·1000	·1167	·1333	·1500	·1667	·1833	·2000	·2167	·2333
Ghaṭikas ...	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**
Fraction of day ...	·5167	·5333	·5500	·5667	·5833	·6000	·6167	·6333	·6500	·6667	·6833	·7000	·7167	·7333
Palas ...	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**12**	**15**	**17**	**20**
Fraction of day ...	·0003	·0005	·0008	·0011	·0014	·0017	·0019	·0022	·0025	·0028	·0033	·0042	·0047	·0055

NAKSHA

s Shortest interval in days from new moon to ending

Longitude at commencement. Deg.	Min.	Order	Names of nakshatras.	Days.	Order	Ordinarily Vaiśākha	Order	Ordinarily Jyeshṭha	Order	Ordinarily Āshādha	Order	Ordinarily Śrāvaṇa	Order	Ordinarily Bhādrapada	Order	Ordinarily Āśvina	Order	Ordinarily Kārttika
						I		II		III		IV		V		VI		VII
		27	Revati		**3**	0·9892	**5**	0·8041	**7**	0·6190	**9**	0·4339	**11**	0·2488	**13**	0·0638	**16**	0·8906
0	0	**1**	Aśvini	1·0119	**4**	2·0011	**6**	1·8160	**8**	1·6309	**10**	1·4458	**12**	1·2608	**14**	1·0757	**17**	1·9025
13	20	**2**	Bharaṇi	2·0238	**5**	3·0130	**7**	2·8279	**9**	2·6428	**11**	2·4578	**13**	2·2727	**15**	2·0876	**18**	2·9144
26	40	**3**	Kṛittikā	3·0357	**6**	4·0249	**8**	3·8398	**10**	3·6548	**12**	3·4697	**14**	3·2846	**16**	3·0995	**19**	3·9263
40	0	**4**	Rohiṇi	4·0476	**7**	5·0368	**9**	4·8518	**11**	4·6667	**13**	4·4816	**15**	4·2965	**17**	4·1114	**20**	4·9382
53	20	**5**	Mṛigaśira	5·0596	**8**	6·0488	**10**	5·8637	**12**	5·6786	**14**	5·4935	**16**	5·3084	**18**	5·1233	**21**	5·9502
66	40	**6**	Ardrā	6·0715	**9**	7·0607	**11**	6·8756	**13**	6·6905	**15**	6·5054	**17**	6·3203	**19**	6·1352	**22**	6·9621
80	0	**7**	Punarvasu	7·0834	**10**	8·0726	**12**	7·8875	**14**	7·7024	**16**	7·5173	**18**	7·3322	**20**	7·1472	**23**	7·9740
93	20	**8**	Pushya	8·0953	**11**	9·0845	**13**	8·8994	**15**	8·7143	**17**	8·5292	**19**	8·3442	**21**	8·1591	**24**	8·9859
106	40	**9**	Aśleshā	9·1072	**12**	10·0964	**14**	9·9113	**16**	9·7262	**18**	9·5412	**20**	9·3561	**22**	9·1710	**25**	9·9978
120	0	**10**	Maghā	10·1191	**13**	11·1083	**15**	10·9232	**17**	10·7382	**19**	10·5531	**21**	10·3680	**23**	10·1829	**26**	11·0097
133	20	**11**	Pūrva Phalgunī ...	11·1310	**14**	12·1202	**16**	11·9352	**18**	11·7501	**20**	11·5650	**22**	11·3799	**24**	11·1948	**27**	12·0216
146	40	**12**	Uttara Phalgunī ...	12·143	**15**	13·1322	**17**	12·9471	**19**	12·7620	**21**	12·5769	**23**	12·3918	**25**	12·2067	**1**	13·0336
160	0	**13**	Hasta	13·1549	**16**	14·1441	**18**	13·9590	**20**	13·7739	**22**	13·5888	**24**	13·4037	**26**	13·2186	**2**	14·0455
173	20	**14**	Chitrā...	14·1668	**17**	15·1560	**19**	14·9709	**21**	14·7858	**23**	14·6007	**25**	14·4156	**27**	14·2306	**3**	15·0574
186	40	**15**	Svāti	15·1787	**18**	16·1679	**20**	15·9828	**22**	15·7977	**24**	15·6126	**26**	15·4276	**1**	15·2425	**4**	16·0693
200	0	**16**	Viśākhā	16·1906	**19**	17·1798	**21**	16·9947	**23**	16·8096	**25**	16·6246	**27**	16·4395	**2**	16·2544	**5**	17·0812
213	20	**17**	Anurādhā	17·2027	**20**	18·1917	**22**	18·0066	**24**	17·8216	**26**	17·6365	**1**	17·4514	**3**	17·2663	**6**	18·0931
226	40	**18**	Jyeshṭhā	18·2144	**21**	19·2036	**23**	19·0186	**25**	18·8335	**27**	18·6484	**2**	18·4633	**4**	18·2782	**7**	19·1050
240	0	**19**	Mūla	19·2264	**22**	20·2156	**24**	20·0305	**26**	19·8454	**1**	19·6603	**3**	19·4752	**5**	19·2901	**8**	20·1169
253	20	**20**	Pūrva-Āshāḍhā ...	20·2083	**23**	21·2275	**25**	21·0424	**27**	20·8573	**2**	20·6722	**4**	20·4871	**6**	20·3020	**9**	21·1289
266	40	**21**	Uttara-Āshāḍhā ...	21·2502	**24**	22·2394	**26**	22·0543	**1**	21·8692	**3**	21·6841	**5**	21·4990	**7**	21·3139	**10**	22·1408
280	0	**22**	Śrāvaṇa	22·2621	**25**	23·2513	**27**	23·0662	**2**	22·8811	**4**	22·6960	**6**	22·5109	**8**	22·3259	**11**	23·1527
293	20	**23**	Sravishta	23·2740	**26**	24·2632	**1**	24·0781	**3**	23·8930	**5**	23·7079	**7**	23·5229	**9**	23·3378	**12**	24·1646
306	40	**24**	Satabhisaj	24·2859	**27**	25·2751	**2**	25·0900	**4**	24·9049	**6**	24·7199	**8**	24·5348	**10**	24·3497	**13**	25·1765
320	0	**25**	Pūrva-Bhadrapadā ...	25·2978	**1**	26·2870	**3**	26·1019	**5**	25·9169	**7**	25·7318	**9**	25·5467	**11**	25·3616	**14**	26·1884
333	20	**26**	Uttara-Bhadrapadā...	26·3098	**2**	27·2990	**4**	27·1139	**6**	26·9288	**8**	26·7437	**10**	26·5586	**12**	26·3735	**15**	27·2003
346	40	**27**	Revati	27·3217	**3**	28·3109	**5**	28·1258	**7**	27·9407	**9**	27·7556	**11**	27·5705	**13**	27·3854	**16**	28·2123
					4	29·3228	**6**	29·1377	**8**	28·9526	**10**	28·7675	**12**	28·5824	**14**	28·3973	**17**	29·2242
															15	29·4093		

YOGAS

v Shortest interval in days from new moon to

Longitude at commencement. Deg.	Min.	Order	Names of yogas.	Days.	Order	Ordinarily Vaiśākha	Order	Ordinarily Jyeshṭha	Order	Ordinarily Āshādha	Order	Ordinarily Śrāvaṇa	Order	Ordinarily Bhādrapada	Order	Ordinarily Āśvina	Order	Ordinarily Kārttika
		27	Vaidhriti	...	**5**	0·8992	**9**	0·5548	**13**	0·2104	**18**	0·8075	**22**	0·4631	**26**	0·1187	**4**	0·7157
0	0	**1**	Viskamba	0·9415	**6**	1·8407	**10**	1·4963	**14**	1·1519	**19**	1·7490	**23**	1·4046	**27**	1·0601	**5**	1·6572
13	20	**2**	Priti	1·8830	**7**	2·7822	**11**	2·4378	**15**	2·0934	**20**	2·6905	**24**	2·3460	**1**	2·0016	**6**	2·5987
26	40	**3**	Ayushmat	2·8245	**8**	3·7237	**12**	3·3793	**16**	3·0349	**21**	3·6319	**25**	3·2875	**2**	2·9431	**7**	3·5402
40	0	**4**	Saubhagya	3·7660	**9**	4·6652	**13**	4·3208	**17**	3·9763	**22**	4·5734	**26**	4·2290	**3**	3·8846	**8**	4·4817
53	20	**5**	Sobhana	4·7074	**10**	5·6067	**14**	5·2622	**18**	4·9178	**23**	5·5149	**27**	5·1705	**4**	4·8261	**9**	5·4232
66	40	**6**	Atiganda	5·6489	**11**	6·5482	**15**	6·2037	**19**	5·8593	**24**	6·4564	**1**	6·1120	**5**	5·7676	**10**	6·3647
80	0	**7**	Sukarman	6·5904	**12**	7·4896	**16**	7·1452	**20**	6·8008	**25**	7·3979	**2**	7·0535	**6**	6·7091	**11**	7·3062
93	20	**8**	Dhriti	7·5319	**13**	8·4311	**17**	8·0867	**21**	7·7423	**26**	8·3394	**3**	7·9950	**7**	7·6506	**12**	8·2477
106	40	**9**	Śula	8·4734	**14**	9·3726	**18**	9·0282	**22**	8·6838	**27**	9·2809	**4**	8·9365	**8**	8·5921	**13**	9·1891
120	0	**10**	Ganda	9·4149	**15**	10·3141	**19**	9·9697	**23**	9·6253	**1**	10·2224	**5**	9·8780	**9**	9·5335	**14**	10·1306
133	20	**11**	Vriddhi	10·3564	**16**	11·2556	**20**	10·9112	**24**	10·5668	**2**	11·1639	**6**	10·8195	**10**	10·4750	**15**	11·0721
146	40	**12**	Dhruva	11·2979	**17**	12·1971	**21**	11·8527	**25**	11·5083	**3**	12·1053	**7**	11·7609	**11**	11·4165	**16**	12·0136
160	0	**13**	Vyaghata	12·2394	**18**	13·1386	**22**	12·7942	**26**	12·4498	**4**	13·0468	**8**	12·7024	**12**	12·3580	**17**	12·9551
173	20	**14**	Harshana	13·1808	**19**	14·0801	**23**	13·7357	**27**	13·3912	**5**	13·9883	**9**	13·6439	**13**	13·2995	**18**	13·8966
186	40	**15**	Vajra	14·1223	**20**	15·0216	**24**	14·6771	**1**	14·3327	**6**	14·9298	**10**	14·5854	**14**	14·2410	**19**	14·8381
200	0	**16**	Siddhi	15·0638	**21**	15·9630	**25**	15·6186	**2**	15·2742	**7**	15·8713	**11**	15·5269	**15**	15·1825	**20**	15·7796
213	20	**17**	Vyatipata	16·0053	**22**	16·9045	**26**	16·5601	**3**	16·2157	**8**	16·8128	**12**	16·4684	**16**	16·1240	**21**	16·7211
226	40	**18**	Variyas	16·9468	**23**	17·8460	**27**	17·5016	**4**	17·1572	**9**	17·7543	**13**	17·4009	**17**	17·0655	**22**	17·0825
240	0	**19**	Parigha	17·8883	**24**	18·7875	**1**	18·4431	**5**	18·0037	**10**	18·6958	**14**	18·3514	**18**	18·0070	**23**	18·6040
253	20	**20**	Siva	18·8298	**25**	19·7290	**2**	19·3846	**6**	19·6402	**11**	19·6373	**15**	19·2929	**19**	18·9484	**24**	19·5455
266	40	**21**	Siddha	19·7713	**26**	20·6705	**3**	20·3261	**7**	19·9817	**12**	20·5788	**16**	20·2343	**20**	19·8899	**25**	20·4870
280	0	**22**	Sadhya	20·7128	**27**	21·6120	**4**	21·2676	**8**	20·9232	**13**	21·5202	**17**	21·1758	**21**	20·8314	**26**	21·4285
293	20	**23**	Subha	21·6543	**1**	22·5535	**5**	22·2091	**9**	21·8647	**14**	22·4617	**18**	22·1173	**22**	21·7729	**27**	22·3700
306	40	**24**	Śukla	22·5957	**2**	23·4950	**6**	23·1506	**10**	22·8061	**15**	23·4032	**19**	23·0588	**23**	22·7144	**1**	23·3115
320	0	**25**	Brahman	23·5372	**3**	24·4365	**7**	24·0920	**11**	23·7476	**16**	24·3447	**20**	24·0003	**24**	23·6559	**2**	24·2530
333	20	**26**	Indra	24·4787	**4**	25·3779	**8**	25·0335	**12**	24·6891	**17**	25·2862	**21**	24·9418	**25**	24·5974	**3**	25·1945
346	40	**27**	Vaidhriti	25·4202	**5**	26·3194	**9**	25·9750	**13**	25·6306	**18**	26·2277	**22**	25·8833	**26**	25·5389	**4**	26·1360
					6	27·2609	**10**	26·9165	**14**	26·5721	**19**	27·1692	**23**	26·8248	**27**	26·4804	**5**	27·0774
					7	28·2024	**11**	27·8580	**15**	27·5136	**20**	28·1107	**24**	27·7663	**1**	27·4219	**6**	28·0189
					8	29·1439	**12**	28·7995	**16**	28·4551	**21**	29·0522	**25**	28·7078	**2**	28·3638	**7**	28·9604
									17	29·3966					**3**	29·3048		

q Days counted from April 1

	Apr. 1	May 1	June 1	July 1	Aug. 1	Sep. 1	Oct. 1	Nov. 1	Dec. 1	Jan. 1	Feb. 1	Mar. 1		
April ...	1	31	62	92	123	154	184	215	245	276	307	335		
												Leap Year, Ap. 336		
15	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
2500	·2667	·2833	·3000	·3167	·3333	·3500	·3667	·3833	·4000	·4167	·4333	·4500	·4667	·4833	·5000
45	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
·7500	·7667	·7833	·8000	·8167	·8333	·8500	·8667	·8833	·9000	·9167	·9333	·9500	·9667	·9833	1·0000
22	**25**	**27**	**30**	**32**	**35**	**37**	**40**	**42**	**45**	**47**	**50**	**52**	**55**	**57**	**60**
·0061	·0069	·0075	·0083	·0089	·0097	·0103	·0111	·0117	·0125	·0130	·0139	·0144	·0153	·0158	·0167

TRAS.

moment of each nakshatra.

Order	Ordinarily Mārgaśirsha.	Order	Ordinarily Pausha	Order	Ordinarily Māgha	Order	Ordinarily Phālguna	Order	Chaitra, when no Adhika Masa.	Order	Chaitra when there is Adhika Masa.
	VIII		**IX**		**X**		**XI**		**XII**		**XIII**
18	0·7055	**20**	0·5204	**22**	0·3353	**24**	0·1502	**27**	0·9771	**2**	0·7920
19	1·7174	**21**	1·5323	**23**	1·3472	**25**	1·1622	**1**	1·9890	**3**	1·8039
20	2·7293	**22**	2·5442	**24**	2·3592	**26**	2·1741	**2**	3·0009	**4**	2·8158
21	3·7412	**23**	3·5562	**25**	3·3711	**27**	3·1860	**3**	4·0128	**5**	3·8277
22	4·7532	**24**	4·5681	**26**	4·3830	**1**	4·1979	**4**	5·0247	**6**	4·8396
23	5·7651	**25**	5·5800	**27**	5·3949	**2**	5·2098	**5**	6·0366	**7**	5·8516
24	6·7770	**26**	6·5919	**1**	6·4068	**3**	6·2217	**6**	7·0486	**8**	6·8635
25	7·7889	**27**	7·6038	**2**	7·4187	**4**	7·2336	**7**	8·0605	**9**	7·8754
26	8·8008	**1**	8·6157	**3**	8·4306	**5**	8·2456	**8**	9·0724	**10**	8·8873
27	9·8127	**2**	9·6276	**4**	9·4426	**6**	9·2575	**9**	10·0843	**11**	9·8992
1	10·8246	**3**	10·6396	**5**	10·4545	**7**	10·2694	**10**	11·0962	**12**	10·9111
2	11·8366	**4**	11·6515	**6**	11·4664	**8**	11·2813	**11**	12·1081	**13**	11·9230
3	12·8485	**5**	12·6634	**7**	12·4783	**9**	12·2932	**12**	13·1200	**14**	12·9350
4	13·8604	**6**	13·6753	**8**	13·4902	**10**	13·3051	**13**	14·1320	**15**	13·9469
5	14·8723	**7**	14·6872	**9**	14·5021	**11**	14·3170	**14**	15·1439	**16**	14·9588
6	15·8842	**8**	15·6991	**10**	15·5140	**12**	15·3290	**15**	16·1558	**17**	15·9707
7	16·8961	**9**	16·7110	**11**	16·5260	**13**	16·3409	**16**	17·1677	**18**	16·9826
8	17·9080	**10**	17·7230	**12**	17·5379	**14**	17·3528	**17**	18·1796	**19**	17·9945
9	18·9199	**11**	18·7349	**13**	18·5498	**15**	18·3647	**18**	19·1915	**20**	19·0064
10	19·9319	**12**	19·7468	**14**	19·5617	**16**	19·3766	**19**	20·2034	**21**	20·0183
11	20·9438	**13**	20·7587	**15**	20·5736	**17**	20·3885	**20**	21·2153	**22**	21·0303
12	21·9557	**14**	21·7706	**16**	21·5855	**18**	21·4004	**21**	22·2273	**23**	22·0422
13	22·9676	**15**	22·7825	**17**	22·5974	**19**	22·4124	**22**	23·2392	**24**	23·0541
14	23·9795	**16**	23·7944	**18**	23·6094	**20**	23·4243	**23**	24·2511	**25**	24·0660
15	24·9914	**17**	24·8064	**19**	24·6213	**21**	24·4362	**24**	25·2630	**26**	25·0779
16	26·0033	**18**	25·1883	**20**	25·6332	**22**	25·4481	**25**	26·2749	**27**	26·0898
17	27·0153	**19**	26·8302	**21**	26·6451	**23**	26·4600	**26**	27·2868	**1**	27·1017
18	28·0272	**20**	27·8421	**22**	27·6570	**24**	27·4719	**27**	28·2987	**2**	28·1137
19	29·0391	**21**	28·8540	**23**	28·6689	**25**	28·4838	**1**	29·3107	**3**	29·1256
						26	29·4957				

ending moment of each yoga.

Order	Ordinarily Mārgaśirsha	Order	Ordinarily Pausha	Order	Ordinarily Māgha	Order	Ordinarily Phālguna	Order	Chaitra, when no Adhika Masa	Order	Chaitra when there is Adhika Masa
8	0·3713	**12**	0·0269	**17**	0·6240	**21**	0·2796	**26**	0·8767	**3**	0·5323
9	1·3128	**13**	0·9684	**18**	1·5655	**22**	1·2211	**27**	1·8182	**4**	1·4737
10	2·2543	**14**	1·9099	**19**	2·5070	**23**	2·1626	**1**	2·7596	**5**	2·4152
11	3·1958	**15**	2·8514	**20**	3·4485	**24**	3·1041	**2**	3·7011	**6**	3·3567
12	4·1373	**16**	3·7929	**21**	4·3900	**25**	4·0455	**3**	4·6426	**7**	4·2982
13	5·0788	**17**	4·7344	**22**	5·3314	**26**	4·9870	**4**	5·5841	**8**	5·2397
14	6·0203	**18**	5·6759	**23**	6·2729	**27**	5·9285	**5**	6·5256	**9**	6·1812
15	6·9618	**19**	6·6173	**24**	7·2144	**1**	6·8700	**6**	7·4671	**10**	7·1227
16	7·9032	**20**	7·5588	**25**	8·1559	**2**	7·8115	**7**	8·4086	**11**	8·0642
17	8·8447	**21**	8·5003	**26**	9·0974	**3**	8·7530	**8**	9·3501	**12**	9·0057
18	9·7862	**22**	9·4418	**27**	10·0389	**4**	9·6945	**9**	10·2916	**13**	9·9472
19	10·7277	**23**	10·833	**1**	10·9804	**5**	10·6360	**10**	11·2331	**14**	10·8886
20	11·6692	**24**	11·3248	**2**	11·9219	**6**	11·5775	**11**	12·1745	**15**	11·8301
21	12·6107	**25**	12·2663	**3**	12·8634	**7**	12·5190	**12**	13·1160	**16**	12·7716
22	13·5522	**26**	13·2078	**4**	13·8048	**8**	13·4604	**13**	14·0575	**17**	13·7131
23	14·4937	**27**	14·1493	**5**	14·7463	**9**	14·4019	**14**	14·9990	**18**	14·6546
24	15·4352	**1**	15·0907	**6**	15·6878	**10**	15·3434	**15**	15·9405	**19**	15·5961
25	16·3766	**2**	16·0322	**7**	16·6293	**11**	16·2849	**16**	16·8820	**20**	16·5376
26	17·3181	**3**	16·9737	**8**	17·5708	**12**	17·2264	**17**	17·8235	**21**	17·4791
27	18·2596	**4**	17·9152	**9**	18·5123	**13**	18·1679	**18**	18·7650	**22**	18·4206
1	19·2011	**5**	18·8567	**10**	19·4538	**14**	19·1094	**19**	19·7065	**23**	19·3621
2	20·1426	**6**	19·7982	**11**	20·3953	**15**	20·0509	**20**	20·6479	**24**	20·3035
3	21·0841	**7**	20·7397	**12**	21·3368	**16**	20·9924	**21**	21·5894	**25**	21·2450
4	22·0256	**8**	21·6812	**13**	22·2783	**17**	21·9338	**22**	22·5309	**26**	22·1865
5	22·9671	**9**	22·6227	**14**	23·2197	**18**	22·8753	**23**	23·4724	**27**	23·1280
6	23·9086	**10**	23·5642	**15**	24·1612	**19**	23·8168	**24**	24·4134	**1**	24·0695
7	24·8501	**11**	24·5056	**16**	25·1027	**20**	24·7583	**25**	25·3554	**2**	25·0110
8	25·7915	**12**	25·4471	**17**	26·0442	**21**	25·6998	**26**	26·2969	**3**	25·9525
9	26·7330	**13**	26·3886	**18**	26·9857	**22**	26·6413	**27**	27·2384	**4**	26·8940
10	27·6745	**14**	27·3301	**19**	27·9272	**23**	27·5828	**1**	28·1799	**5**	27·8355
11	28·6160	**15**	28·2716	**20**	28·8687	**24**	28·5243	**2**	29·1214	**6**	28·7769
		16	29·2131			**25**	29·4658				

Annual correction.

Argument:—Date of appearance of 1st new moon in each solar year according to Table X.

The correction corresponding to the decimal portion of the argument should be subtracted from the nakshatra or yoga correction corresponding to the integral portion; thus the nakshatra correction corresponding to an argument 28·53 = 0·11 *minus* ·04 = 0·07.

NAKSHATRAS.

Arg.	Corrn. t	Arg.	Corrn. u	Arg.	Corrn. u	Arg.	Corrn. u	Arg.	Corrn. u
0	2·20890	**·01**	·00075	**·30**	·02244	**·59**	·04413	**·88**	·06582
1	2.13410	**·02**	·00150	**·31**	·02319	**·60**	·04488	**·89**	·06657
2	2·05930	**·03**	·00224	**·32**	·02394	**·61**	·04563	**·90**	·06732
3	1·98450	**·04**	·00299	**·33**	·02468	**·62**	·04638	**·91**	·06807
4	1·90970	**·05**	·00374	**·34**	·02543	**·63**	·04712	**·92**	·06882
5	1·83490	**·06**	·00449	**·35**	·02618	**·64**	·04787	**·93**	·06956
6	1·76010	**·07**	·00524	**·36**	·02693	**·65**	·04862	**·94**	·07031
7	1·68531	**·08**	·00598	**·37**	·02768	**·66**	·04937	**·95**	·07106
8	1·61049	**·09**	·00673	**·38**	·02842	**·67**	·05012	**·96**	·07181
9	1·53569	**·10**	·00748	**·39**	·02917	**·68**	·05086	**·97**	·07256
10	1·46089	**·11**	·00823	**·40**	·02992	**·69**	·05161	**·98**	·07330
11	1·38609	**·12**	·00898	**·41**	·03067	**·70**	·05236	**·99**	·07405
12	1·31129	**·13**	·00972	**·42**	·03142	**·71**	·05311		
13	1·23649	**·14**	·01047	**·43**	·03216	**·72**	·05386		
14	1·16169	**·15**	·01122	**·44**	·03291	**·73**	·05460		
15	1·08689	**·16**	·01197	**·45**	·03366	**·74**	·05535		
16	1·01209	**·17**	·01272	**·46**	·03441	**·75**	·05610		
17	0·93729	**·18**	·01346	**·47**	·03516	**·76**	·05685		
18	0·86249	**·19**	·01421	**·48**	·03590	**·77**	·05760		
19	0·78769	**·20**	·01496	**·49**	·03665	**·78**	·05834		
20	0·71288	**·21**	·01571	**·50**	·03740	**·79**	·05909		
21	0·63808	**·22**	·01646	**·51**	·03815	**·80**	·05984		
22	0·56328	**·23**	·01720	**·52**	·03890	**·81**	·06059		
23	0·48848	**·24**	·01795	**·53**	·03964	**·82**	·06134		
24	0·41368	**·25**	·01870	**·54**	·04039	**·83**	·06208		
25	0·33888	**·26**	·01945	**·55**	·04114	**·84**	·06283		
26	0·26408	**·27**	·02020	**·56**	·04189	**·85**	·06358		
27	0·18928	**·28**	·02094	**·57**	·04264	**·86**	·06433		
28	0·11448	**·29**	·02169	**·58**	·04338	**·87**	·06508		
29	0·03968								

YOGAS.

See note on ANNUAL CORRECTION *supra*.

	w		x		x		x		x
0	4·11036	**·01**	·00139	**·30**	·04176	**·59**	·08212	**·88**	·12249
1	3·97117	**·02**	·00278	**·31**	·04315	**·60**	·08351	**·89**	·12388
2	3·83198	**·03**	·00417	**·32**	·04454	**·61**	·08491	**·90**	·12527
3	3·69279	**·04**	·00557	**·33**	·04593	**·62**	·08630	**·91**	·12666
4	3·55360	**·05**	·00696	**·34**	·04732	**·63**	·08769	**·92**	·12805
5	3·41441	**·06**	·00835	**35**	·04872	**·64**	·08908	**·93**	·12945
6	3·27522	**·07**	·00974	**·36**	·05011	**·65**	·09047	**·94**	·13084
7	3·13603	**·08**	·01113	**·37**	·05150	**·66**	·09186	**·95**	·13223
8	2·99684	**·09**	·01253	**·38**	·05289	**·67**	·09326	**·96**	·13362
9	2·85765	**·10**	·01392	**·39**	·05428	**·68**	·09465	**·97**	·13601
10	2·71846	**·11**	·01530	**·40**	·05568	**·69**	·09604	**·98**	·13641
11	2·57927	**·12**	·01670	**·41**	·05707	**·70**	·09743	**·99**	·13780
12	2·44008	**·13**	·01809	**·42**	·05846	**·71**	·09882		
13	2·30089	**·14**	·01949	**·43**	·05985	**·72**	·10022		
14	2·16170	**·15**	·02088	**·44**	·06124	**·73**	·10161		
15	2·02251	**·16**	·02227	**·45**	·06263	**·74**	·10300		
16	1·88332	**·17**	·02366	**·46**	·06493	**·75**	·10439		
17	1·74413	**·18**	·02505	**·47**	·06542	**·76**	·10578		
18	1·60494	**·19**	·02645	**·48**	·06681	**·77**	·10798		
19	1·46575	**·20**	·02784	**·49**	·06820	**·78**	·10851		
20	1·32656	**·21**	·02923	**·50**	·06959	**·79**	·10996		
21	1·18737	**·22**	·03063	**·51**	·07098	**·80**	·11135		
22	1·04818	**·23**	·03291	**·52**	·07238	**·81**	·11274		
23	0·90899	**·24**	·03340	**·53**	·07377	**·82**	·11413		
24	0·76980	**·25**	·03480	**54**	·07516	**·83**	·11553		
25	0·63061	**·26**	·03619	**·55**	·07655	**·84**	·11692		
26	0·49142	**·27**	·03758	**·56**	·07795	**·85**	·11831		
27	0·35223	**·28**	·03897	**·57**	·07934	**·86**	·11970		
28	0·21304	**·29**	·04036	**·58**	·08073	**·87**	·12108		
29	0·07385								

y Calendar to be used with Table II, as directed in specimen problems, for ascertaining the A.D. month and day corresponding to any solar date, lunar tithi, nakshatra, yoga or karana.

Day of solar year.	Tithi No.	Ending moment of tithi.	℄'s An. for each tithi.

Vaiśākha.

0	·9843	1	0·984
1	·9687	2	1·969
2	·9530	3	2·953
3	·9374	4	3·937
4	·9217	5	4·921
5	·9061	6	5·906
6	·8904	7	6·890
7	·8748	8	7·875
8	·8592	9	8·859
9	·8435	10	9·843
10	·8279	11	10·827
11	·8122	12	11·812
12	·7966	13	12·797
13	·7809	14	13·781
14	·7652	15	14·765
15	·7496	1	15·750
16	·7340	2	16·734
17	·7183	3	17·718
18	·7027	4	18·703
19	·6870	5	19·687
20	·6714	6	20·671
21	·6557	7	21·656
22	·6401	8	22·640
23	·6244	9	23·624
24	·6088	10	24·609
25	·5932	11	25·593
26	·5775	12	26·577
27	·5619	13	0·007
28	·5462	14	0·992
29	·5306	15	1·976

Jyeshṭha.

30	·5149	1	2·960
31	·4993	2	3·945
32	·4836	3	4·929
33	·4680	4	5·913
34	·4523	5	6·898
35	·4367	6	7·882
36	·4210	7	8·866
37	·4054	8	9·851
38	·3898	9	10·835
39	·3741	10	11·819
40	·3585	11	12·804
41	·3428	12	13·788
42	·3272	13	14·773
43	·3115	14	15·757
44	·2959	15	16·741
45	·2802	1	17·726
46	·2646	2	18·710
47	·2489	3	19·694
48	·2333	4	20·679
49	·2176	5	21·663
50	·2020	6	22·647
51	·1863	7	23·632
52	·1707	8	24·616
53	·1551	9	25·600
54	·1394	10	26·585
55	·1238	11	0·015
56	·1081	12	0·999
57	·0925	13	1·983
58	·0768	14	2·968
59	·0612	15	3·952

Āshāḍha.

60	·0455	1	4·936
61	·0299	2	5·921
62	·0142	3	6·905
62	·9986	4	7·889
63	·9829	5	8·874

Āshāḍha—*cont.*

64	·9673	6	9·858
65	·9516	7	10·842
66	·9360	8	11·827
67	·9203	9	12·811
68	·9047	10	13·795
69	·8891	11	14·780
70	·8734	12	15·764
71	·8578	13	16·749
72	·8421	14	17·733
73	·8265	15	18·717
74	·8108	1	19·702
75	·7952	2	20·686
76	·7795	3	21·670
77	·7639	4	22·655
78	·7482	5	23·639
79	·7326	6	24·623
80	·7169	7	25·608
81	·7013	8	26·592
82	·6856	9	0·022
83	·6700	10	1·006
84	·6543	11	1·991
85	·6387	12	2·975
86	·6231	13	3·959
87	·6074	14	4·944
88	·5918	15	5·928

Śrāvaṇa.

89	·5761	1	6·912
90	·5605	2	7·897
91	·5448	3	8·881
92	·5292	4	9·865
93	·5135	5	10·850
94	·4979	6	11·834
95	·4822	7	12·818
96	·4666	8	13·803
97	·4509	9	14·787
98	·4353	10	15·771
99	·4196	11	16·756
100	·4040	12	17·740
101	·3883	13	18·725
102	·3727	14	19·709
103	·3571	15	20·693
104	·3414	1	21·678
105	·3258	2	22·662
106	·3101	3	23·646
107	·2945	4	24·631
108	·2788	5	25·615
109	·2632	6	26·599
110	·2475	7	0·029
111	·2319	8	1·013
112	·2162	9	1·998
113	·2006	10	2·982
114	·1849	11	3·966
115	·1693	12	4·951
116	·1536	13	5·935
117	·1380	14	6·920
118	·1223	15	7·904

Bhādrapada.

119	·1067	1	8·888
120	·0911	2	9·873
121	·0754	3	10·857
122	·0598	4	11·841
123	·0441	5	12·826
124	·0285	6	13·810
125	·0128	7	14·794
125	·9972	8	15·779
126	·9815	9	16·763
127	·9659	10	17·747

Bhādrapada—*cont.*

128	·9502	11	18·732
129	·9346	12	19·716
130	·9189	13	20·700
131	·9033	14	21·685
132	·8876	15	22·669
133	·8720	1	23·654
134	·8563	2	24·638
135	·8407	3	25·622
136	·8251	4	26·607
137	·8094	5	0·036
138	·7938	6	1·021
139	·7781	7	2·005
140	·7625	8	2·989
141	·7468	9	3·974
142	·7312	10	4·958
143	·7155	11	5·942
144	·6999	12	6·927
145	·6842	13	7·911
146	·6686	14	8·896
147	·6529	15	9·880

Āśvina.

148	·6373	1	10·864
149	·6216	2	11·849
150	·6060	3	12·833
151	·5904	4	13·817
152	·5747	5	14·802
153	·5591	6	15·786
154	·5434	7	16·770
155	·5278	8	17·755
156	·5121	9	18·739
157	·4965	10	19·723
158	·4808	11	20·708
159	·4652	12	21·692
160	·4495	13	22·676
161	·4339	14	23·661
162	·4182	15	24·645
163	·4026	1	25·630
164	·3869	2	26·614
165	·3713	3	0·044
166	·3556	4	1·028
167	·3400	5	2·012
168	·3244	6	2·997
169	·3087	7	3·981
170	·2931	8	4·965
171	·2774	9	5·950
172	·2618	10	6·934
173	·2461	11	7·918
174	·2305	12	8·903
175	·2148	13	9·887
176	·1992	14	10·872
177	·1835	15	11·856

Kārttika.

178	·1679	1	12·840
179	·1522	2	13·825
180	·1366	3	14·809
181	·1209	4	15·793
182	·1053	5	16·778
183	·0896	6	17·762
184	·0740	7	18·746
185	·0584	8	19·731
186	·0427	9	20·715
187	·0271	10	21·699
188	·0114	11	22·684
188	·9958	12	23·668
189	·9801	13	24·652
190	·9645	14	25·637
191	·9488	15	26·621

Kārttika—*cont.*

192	·9332	1	0·051
193	·9175	2	1·035
194	·9019	3	2·020
195	·8862	4	3·004
196	·8706	5	3·988
197	·8549	6	4·973
198	·8393	7	5·957
199	·8236	8	6·941
200	·8080	9	7·926
201	·7924	10	8·910
202	·7767	11	9·894
203	·7611	12	10·879
204	·7454	13	11·863
205	·7298	14	12·848
206	·7141	15	13·832

Mārgaśīrsha.

207	·6985	1	14·816
208	·6828	2	15·801
209	·6672	3	16·785
210	·6515	4	17·769
211	·6359	5	18·754
212	·6202	6	19·738
213	·6046	7	20·722
214	·5889	8	21·707
215	·5733	9	22·691
216	·5576	10	23·675
217	·5420	11	24·660
218	·5264	12	25·644
219	·5107	13	26·628
220	·4951	14	0·058
221	·4794	15	1·043
222	·4638	1	2·027
223	·4481	2	3·011
224	·4325	3	3·996
225	·4168	4	4·980
226	·4012	5	5·964
227	·3855	6	6·949
228	·3699	7	7·933
229	·3542	8	8·917
230	·3386	9	9·902
231	·3229	10	10·886
232	·3073	11	11·870
233	·2916	12	12·855
234	·2760	13	13·839
235	·2604	14	14·824
236	·2447	15	15·808

Pausha.

237	·2291	1	16·792
238	·2134	2	17·777
239	·1978	3	18·761
240	·1821	4	19·745
241	·1665	5	20·730
242	·1508	6	21·714
243	·1352	7	22·698
244	·1195	8	23·683
245	·1039	9	24·667
246	·0882	10	25·651
247	·0726	11	26·636
248	·0569	12	0·065
249	·0413	13	1·050
250	·0257	14	2·034
251	·0108	15	3·019
251	·9944	1	4·003
252	·9787	2	4·987
253	·9631	3	5·972
254	·9474	4	6·956
255	·9318	5	7·940

Pausha—*cont.*

256	·9161	6	8·925
257	·9005	7	9·909
258	·8848	8	10·893
259	·8692	9	11·878
260	·8535	10	12·862
261	·8379	11	13·846
262	·8222	12	14·831
263	·8066	13	15·815
264	·7909	14	16·799
265	·7753	15	17·784

Māgha.

266	·7597	1	18·768
267	·7440	2	19·753
268	·7284	3	20·737
269	·7127	4	21·721
270	·6971	5	22·706
271	·6814	6	23·690
272	·6658	7	24·674
273	·6501	8	25·659
274	·6345	9	26·643
275	·6188	10	0·073
276	·6032	11	1·057
277	·5875	12	2·041
278	·5719	13	3·026
279	·5562	14	4·010
280	·5406	15	4·995
281	·5249	1	5·979
282	·5093	2	6·963
283	·4937	3	7·948
284	·4780	4	8·932
285	·4624	5	9·916
286	·4467	6	10·901
287	·4311	7	11·885
288	·4154	8	12·869
289	·3998	9	13·854
290	·3841	10	14·838
291	·3685	11	15·822
292	·3528	12	16·807
293	·3372	13	17·791
294	·3215	14	18·775
295	·3059	15	19·760

Phālguna.

296	·2902	1	20·744
297	·2746	2	21·729
298	·2589	3	22·713
299	·2433	4	23·697
300	·2277	5	24·682
301	·2120	6	25·666
302	·1964	7	26·650
303	·1807	8	0·080
304	·1651	9	1·064
305	·1494	10	2·049
306	·1338	11	3·033
307	·1181	12	4·017
308	·1025	13	5·002
309	·0868	14	5·986
310	·0712	15	6·971
311	·0555	1	7·955
312	·0399	2	8·939
313	·0242	3	9·924
314	·0086	4	10·908
314	·9929	5	11·892
315	·9773	6	12·877
316	·9617	7	13·861
317	·9460	8	14·845
318	·9304	9	15·830
319	·9147	10	16·814

Phālguna—*cont.*

320	·8991	11	17·798
321	·8834	12	18·783
322	·8678	13	19·767
323	·8521	14	20·751
324	·8365	15	21·736

Chaitra (when there is no adhika masa).

325	·8208	1	22·720
326	·8052	2	23·705
327	·7895	3	24·689
328	·7739	4	25·673
329	·7582	5	26·658
330	·7426	6	0·087
331	·7269	7	1·072
332	·7113	8	2·056
333	·6957	9	3·040
334	·6800	10	4·025
335	·6644	11	5·009
336	·6487	12	5·993
337	·6331	13	6·978
338	·6174	14	7·962
339	·6018	15	8·947
340	·5861	1	9·931
341	·5705	2	10·915
342	·5548	3	11·900
343	·5392	4	12·884
344	·5235	5	13·868
345	·5079	6	14·853
346	·4922	7	15·837
347	·4766	8	16·821
348	·4610	9	17·806
349	·4453	10	18·790
350	·4297	11	19·774
351	·4140	12	20·759
352	·3984	13	21·743
353	·3827	14	22·727
354	·3671	15	23·712

Chaitra (when there is adhika masa).

355	·3514	1	24·696
356	·3358	2	25·681
357	·3201	3	26·665
358	·3045	4	0·095
359	·2888	5	1·079
360	·2732	6	2·063
361	·2575	7	3·048
362	·2419	8	4·032
363	·2262	9	5·016
364	·2106	10	6·001
365	·1950	11	6·985
366	·1793	12	7·969
367	·1637	13	8·954
368	·1480	14	9·938
369	·1324	15	10·923
370	·1167	1	11·907
371	·1011	2	12·891
372	·0854	3	13·876
373	·0698	4	14·860
374	·0541	5	15·844
375	·0385	6	16·829
376	·0228	7	17·813
377	·0072	8	18·797
377	·9915	9	19·782
378	·9759	10	20·766
379	·9602	11	21·750
380	·9446	12	22·735
381	·9290	13	23·719
382	·9133	14	24·703
383	·8977	15	25·688

ĀRYA SIDDHĀNTA EYE-TABLE—Specimen problems from ancient Tamil literature.

This Eye-table **alone** will enable any one to solve correctly, to four decimal places of a day, and by a single operation any problem in solar dates, nakshatras or week-days, for 2,000 years, i.e., from B.C. 1 to 2000. A.D. The tables of equations are given to two places of decimals in the abridged sections **e** to **i** of the eye-table—see next page—and to four places of decimals in the unabridged sections **e** to **i**, page 179 to 186 below.

The computation of the ending moment, whether of a tithi, or of a nakshatra, or of a yoga, always comprises four processes: (1) to find the mean ending moment; (2) to find the anomaly or anomalies for that moment; (3) to find the equation or equations corresponding to the anomaly or anomalies; and (4) to add together the mean ending moment and the equation or equations.

Problem I.—Required to find the ending moment, by Ārya siddhānta, of Āshādha Full-moon tithi (when there was a lunar eclipse) in A.D. 634—See the Paripādal horoscope, Ch. V, sec. ii, page 100 of the Text.

Commencement of solar year. Col. 1.	Days of solar year and sun's anomaly in days of solar year. Col. 2.	Moon's anomaly. Col. 3.
600 A.D. ... ... March 19·229165 **k** 84 years ... ... ·78514 **n**		
634 A.D. ... ... March 20·02430 **(1)**		
N.B.—This, by itself, is a valuable piece of information, giving the English year, month, day and fraction of day on which a particular Indian solar year between 1 B.C. and A.D. 2000 commenced by Ārya siddhānta; and this information can be had in a few seconds from the eye-table, sections **k** and **n** for any one of 2,000 years.	First new moon in solar year. { 400 A.D. ... 1·22789 **l**; 34 years ... 13·58446 **o**; 634 A.D. ... 14·81236 **(2)**	25·95007 **m** 19·23974 **p** 14·81236 **(2)**
		60·00217 −55·1090 **d** (2 Anom. months). 4·8932 **(3)** (☾'s An. at 1st N.M. in S. year).
	Add for Āshāḍha new moon ... 59·0612 **b** Do. 15 tithis ... ... 14·7653 **d**	3·952 **c** 14·7653 **d**
	88·6389 **(4)**	23·610 − ·0222 **h** (⊙'s equation). 23·588 **(5)**
Note how stages **(1)**, **(2)**, **(3)**, **(4)**, **(5)**, **(6)**, **(7)** and **(8)** are successively arrived at with the help of the eye-table and then add together **(4)**, **(8)** and **(1)**, as shown in column 2.	Sum of ⊙'s and ☾'s eqns. (Col. 3.) + ·2830 **(3)**	⊙'s eqn. for An. of 88·64 d. **(4)** ... ... − ·0222 **h** **(6)**
	Add commencement of solar year (first column) Mar. 20·0243 **(1)**	☾'s eqn. for An. of 23·588 d. **(5)** ... ... + ·3052 **e** **(7)**
	Actual ending moment Mar. 108·9462 **(9)**	Sum of ⊙'s+☾'s eqns. + ·2830 **(8)**

We reach, for the ending moment of the full-moon tithi, or the centre of the lunar eclipse, March 108·9462. By Eye-table **q**, the 93rd day from March 1 is June 1. Therefore the 108th day from March 1 = June 16 ... **q**; and by Eye-table **r**, ·9500 of a day = 57 ghatikas and ·0032 day = 12 palas.

∴ The full-moon tithi ended and the eclipse occurred, according to Ārya siddhānta, at 56 ghat. 48 palas after mean sunrise or by Table VI at 22 hours, 42½ minutes, i.e., one hour and 17½ minutes before sunrise on Friday, 17th June A.D. 634.

Problem II.—The same problem worked to four places of decimals with the aid of Table II and Eye-tables **y**, **e** *and* **h**.

	Days of solar year.	Moon's mean anomaly in days.	⊙'s and ☾'s equations.
Table II. first new moon in solar year acc. to Ār. siddh. ...	14·8124	4·893	⊙'s eqn. for 88·64 d. = − ·0222 (E.T. **h**)
Eye-table **y**. Āshāḍha Śu. 15	73·8265	18·717	☾'s eqn. for 23·588 d. = + ·3052 (E.T. **e**)
	88·6389	23·610	Sum of ⊙'s + ☾'s eqns. + ·2830
Add sum of ⊙'s and ☾'s eqns. acc. to last column	+ ·2830	− ·0222	(⊙'s eqn. in last column).
Add Eng. month and day, marking commencement of S. yr. A.D. 634–35 (Table II)	Mar. 20·0243	23·588.	

Mar. 108·9462 = June 16, A.D. 634, 56 gh. 48 p. after mean sunrise (E.T. **q** and **r**.)

Same problem.—The shortest method and the one ordinarily used by the author for tithis like the present one, when the Ephemeris is not available.

(*N.B.*—All the entries in the first dotted line are from Table II.)

New moon tithi, Āshāḍha, A.D. 634–5 ... **(4)** June 1·90	1st N.M. in S. year ... ... 14·81	An. of 1st N.M. in S. Yr. ... 4·89 Tab. II	
Eye-table **d**. *Add* for 15 tithis ... 14·78	(E.T. **y**) *Add* for Āshāḍha, Śukla 15 ... ... 73·83	... ... 18·72	**y**
(19) June 16·66	88·64	(Abridged Eye-tab. **h**) ⊙'s eqn. for An. of 88·64 d. ... 23·61 −·02	−·02
Sum of ⊙'s and ☾'s eqns. (last column). + ·28		(Abridged Eye-tab. **e**) ☾'s eqn. for An. of 23·59 d.... 23·59 ...	+·30
			+·28

(19) June 16·94 = Thursday, 16 June A.D. 634, at ·94 of day or 1½ hours or 3½ gh. before sunrise on Friday, 17 June.

Problem III.—Required to find the moment of commencement of the 1st **Svāti** *nakshatra (No. 15) or the ending moment of Chitra nakshatra (No. 14) in the month of Chittirai—Mēsha, A.D. 756, the date probably referred to in Silappadhikāram, Nāḍukūṇkādai.*

(The Ephemeris gives this information complete, but the method may be used in other cases where the Ephemeris is not available.)

Table II. Mean ending moment of new moon tithi, Chaitra, A.D. 755–56	(6) Mar. 5·97	☾'s An. in days.	
,, Anomaly of 1st N.M. in solar year A.D. 755–56	... ...	... 14·66	
Eye-table **c**. *Add* for anomaly of Chaitra new moon, same year (no adhika month).	... ...	21·74	
		36·40	
Eye-table **s** Shortest interval from Chaitra N.M. to nakshatra Chaitra (No. 14) ...	... 15·14	... 15·14	
Eye-table **t**, **u** Nakshatra correction for 1st N.M. in S. year 25·81 days, i.e., correction for 25 days = 0·34 **t**. Correction for ·81 day = − 0·06 **u**.			
Total nakshatra correction for 25·81 days = 0·34 − 0·06 = 0·28	... 0·28	... 0·28	
		51·82	
		− 27·55 (1 An. Mo. E.T. **d**)	
Abridged Eye-table **f**, moon's nak. eqn. for anom. of 24·27 days (last column) ...	+ ·24	24·27	
	(22) Mar. 21·63		

That is, Sunday, 21st March A.D. 756, ·63 of a day, or 38 ghaṭikas after mean sunrise.

EYE-TABLE FOR

NOTE.—The different parts of the Table are lettered in order from a to y and
All the figures, except where otherwise indicated

a Order of signs of zodiac or rāśis and longitude at commencement	1...0°	2...30°	3...60°	4...90°
Bengal solar months	Vaiśākha	Jyeshtha	Ashāḍha	Śrāvaṇa
Tamil and Malayālam solar months; also names of rāśis	Mēsha / Medam	Vrishabha / Edavam	Mithuna	Karkaṭaka
Tamil solar months...	Chittrai	Vaigāśi	Āni	Āḍi
a Moment of sankrānti in days of solar year, and decimals of a day	0·0	30·9250	62·3261	93·9333
English date corresponding to each sankranti (A.D. 1911)	Apr. 13	May 14	June 14	July 16
Lunar months: each month commences *before* sankrānti noted in next column ...	(1) *Vaiśākha*	(2) *Jyeshṭha*	(3) *Ashādha*	(4) *Śrāvaṇa*
b Increase in days, (1) of lunar months, (2) of sun's anomaly	0·000	29·5306	59·0612	88·5918
c " of ☾'s An. when interval between Mēsha sank. and 1st N.M. in sol. year is 0·00 day	0·000	1·976	3·952	5·928

Tithi equivalents in days and

d Tithi equivalent in days	1 ·9843	2 1·9687	3 2·9531	4 3·9374	5 4·9218
	16	**17**	**18**	**19**	**20**
	15·7496	16·7340	17·7182	18·7027	19·6871

e, f, g Moon's equation of the centre and moon's anomaly in days and

	·00	·01	·02	·03	·04	·05	·06	·07	·08	·09	·10	·11	·12	·13	·14	·15	·16	·17	·18	·19	·20
	0·00	0·12	0·23	0·35	0·47	0·58	0·70	0·82	0·94	1·06	1·18	1·30	1·42	1·54	1·66	1·79	1·91	2·04	2·17	2·30	2·43
−	0·00	0·12	0·23	0·35	0·47	0·58	0·70	13·10	13·00	12·90	12·80	12·70	12·60	12·50	12·39	12·29	12·18	12·08	11·97	11·86	11·75
−	13·78	13·68	13·58	13·49	13·39	13·29	13·20	14·46	14·55	14·65	14·75	14·85	14·96	15·06	15·16	15·27	15·37	15·48	15·58	15·69	15·80
+	13·78	13·87	13·97	14·07	14·16	14·26	14·36	26·73	26·62	26·50	26·38	26·26	26·13	26·01	25·89	25·76	25·64	25·51	25·39	25·26	25·13
+	27·55	27·44	27·32	27·20	27·09	26·97	26·85														
	0·00	0·12	0·25	0·38	0·50	0·63	0·75	0·88	1·01	1·14	1·27	1·40	1·53	1·66	1·79	1·93	2·06	2·20	2·34	2·48	2·63
−	0·00	0·12	0·25	0·38	0·50	0·63	0·75	13·04	12·93	12·82	12·71	12·60	12·49	12·38	12·26	12·15	12·03	11·92	11·80	11·67	11·55
−	13·78	13·67	13·57	13·46	13·35	13·25	13·14	14·52	14·62	14·73	14·84	14·95	15·06	15·18	15·29	15·40	15·52	15·64	15·76	15·88	16·01
+	13·78	13·88	13·99	14·09	14·20	14·30	14·41	26·67	26·55	26·42	26·29	26·16	26·03	25·89	25·76	25·63	25·49	25·35	25·21	25·07	24·92
+	27·55	27·43	27·30	27·18	27·05	26·93	26·80														
	0·00	0·13	0·27	0·40	0·54	0·67	0·81	0·94	1·08	1·22	1·36	1·50	1·64	1·78	1·92	2·07	2·22	2·37	2·52	2·67	2·83
−	0·00	0·13	0·27	0·40	0·54	0·67	0·81	12·97	12·86	12·74	12·62	12·50	12·38	12·25	12·13	12·01	11·88	11·75	11·62	11·48	11·34
−	13·78	13·66	13·55	13·43	13·32	13·21	13·09	14·58	14·70	14·81	14·93	15·05	15·17	15·30	15·42	15·54	15·67	15·80	15·94	16·07	16·21
+	13·78	13·89	14·00	14·12	14·23	14·35	14·46	26·61	26·47	26·34	26·20	26·06	25·92	25·77	25·63	25·49	25·34	25·19	25·03	24·88	24·72
+	27·55	27·42	27·29	27·15	27·02	26·88	26·75														

h For tithis. Sun's equation of the centre and sun's anomaly in days of the solar

+·176	+·175	+·17	+·16	+·15	+·14	+·13	+·12	+·11	+·10	+·09	+·08	+·07	+·06	+·05	+·04	+·03	+·02	+·01	+·00
357·90	362	5	15	22	28	33	38	42	46	50	54	57	61	65	68	71	75	78	81·29
352·29	348	340	330	323	317	312	307	303	299	295	291	288	284	281	277	274	271	267	263·92

	−·00	−·01	−·02	−·03	−·04	−·05	−·06	−·07	−·08	−·09	−·10	−·11	−·12	−·13	−·14	−·15	−·16	−·17	−·18	−·19	−·20
i For yogas.—Sun's equation	−·152	−·151	−·150	−·14	−·13	−·12	−·11	−·10	−·09	−·08	−·07	−·06	−·05	−·04	−·03						
= Anomaly in days of solar year	355·88	361	364	13	22	28	34	40	44	49	53	58	62	66	70						
	354·89	350	347	332	324	317	311	306	301	296	292	288	283	279	275						

j Perpetual almanac for European calendar.

[*N.B.*—Heavy type means week-day, Sunday being **1**, Monday **2**, etc.]

	1	**2**	**3**	**4**	**5**	**6**	**7 or 0**
Centuries B.C.	2001	3101	3201				
	2201	2401	2501	2601	2701	2801	2901
	1601	1701	1801	1901	2001	2101	2201
	901	1001	1101	1201	1301	1401	1501
	201	301	401	501	601	701	801
						1	101

N.B.—B.C. years should be made positive thus: 44 B.C. is 57th year of century beginning with 101 B.C. —see page 14 of Text.

Centuries A.D. old style	500	400	300	200	100	0	
	1200	1100	1000	900	800	700	600
			1700	1600	1500	1400	1300
Centuries A.D. new style	1600	1900		1800		1700	
	2000	2300		2200		2100	

N.B.—Old Style ceased in continental countries (exc. Russia) on 4-10-1582 and New Style began on 15-10-1582, 10 days beng dropped. In United Kingdom. New Style began on 14-9-1752, 11 days being dropped.

	1	**2**	**3**	**4**	**5**	**6**	**7 or 0**
Odd years in a century.	1	2	3	...	4	5	6
	7	...	8	9	10	11	...
	12	13	14	15		16	17
	18	19	...	20	21	22	23
	...	24	25	26	27	...	28
	29	30	31	...	32	33	34
	35	...	36	37	38	39	...
	40	41	42	43	...	44	45
	46	47	...	48	49	50	51

	1	**2**	**3**	**4**	**5**	**6**	**7 or 0**
	...	52	53	54	55	...	56
	57	58	59	...	60	61	62
	63		64	65	66	67	...
	68	69	70	71	...	72	73
	74	75	...	76	77	78	79
	...	80	81	82	83	...	84
	85	86	87	...	88	89	90
	91	...	92	93	94	95	...
	96	97	98	99	...	...	...

Months in	**1**	**2**	**3**	**4**	**5**	**6**	**7 or 0**
Ordinary years.	Aug.	Feb. Mar. Nov.	June	Sep. Dec.	Apr. July	Jan. Oct.	May
Leap years ...	Feb.	...	...	...	Jan.	...	...

[*Example.—To find week-day of 26th Jan. 1844—*
Add 4 + 6 + 5 + 26 and divide the total 41 by 7. Remainder, 6 = Friday.]

Ārya siddhānta constants for centuries.

Year A.D.	Kaliyuga. Commencement of solar year. Month and date.	Fraction of day.	First new moon in solar year.	☾'s Anomaly at commencement of solar year.
		k	**l**	**m**
B.C.				
1	3101 Mar. 14	·020832	9·97497	12·44500
A.D.				
100	3201 Mar. 14	·888857	13·43662	0·91097
200	3301 Mar. 15	·756943	16·89826	16·93155
300	3401 Mar. 16	·624998	20·35990	5·39752
400	3501 Mar. 17	·493054	23·82154	21·41810
500	3601 Mar. 18	·361109	27·28318	9·88407
600	3701 Mar. 19	·229165	1·22789	25·95007
700	3801 Mar. 20	·097220	4·70320	14·46145
800	3901 Mar. 20	·965276	8·17851	2·97285
900	4001 Mar. 21	·833331	11·65383	19·03883
1000	4101 Mar. 22	·701387	15·12914	7·55022
1100	4201 Mar. 23	·569442	18·60446	23·61622
1200	4301 Mar. 24	·437498	22·07977	12·12760
1300	4401 Mar. 25	·305553	25·55508	0·63900
1400	4501 Mar. 26	·173609	29·03039	16·70498
1500	4601 Mar. 27	·041664	2·97511	5·21637
1600	4701 Mar. 27	·909720	6·45043	21·28237
1700	4801 Mar. 28	·777775	9·92574	9·79375
1800	4901 Apr. 10	·645831	13·40105	25·85975
1900	5001 Apr. 12	·513886	16·87636	14·37114

ĀRYA SIDDHĀNTA.

the way in which they are to be used is shown in the specimen problems on reverse.

represent days and fractions of a day.

5 ... 120°	6 ... 150°	7 ... 180°	8 ... 210°	9 ... 240°	10 ... 270°	11 ... 300°	12 ... 330°	
Bhādrapada	Āśvina	Kārttika	Mārgaśirsha	Pausha	Māgha	Phālguna	Chaitra.	
Siṁha	Kanyā	Tulā	Vṛiśchika	Dhanus	Makara	Kumbha	Mina	——
Āvaṇi	Puraṭṭāsi	Aippaśi	Kārttigai	Mārgaḷi	Tai	Māśi	Paṅguni	
125·4011	156·4358	186·8925	216·7958	246·3044	275·6550	305·1117	334·9200	365·2588
Aug. 16	Sep. 16	Oct. 17	Nov. 16	Dec. 15	Jan. 14	Feb. 12	Mar. 13	
(5) *Bhādrapada*	(6) *Āśvina*	(7) *Kārttika*	(8) *Mārgaśīrsha*	(9) *Pausha*	(10) *Māgha*	(11) *Phālguna*	(12) *Chaitra*	(13) *Chaitra when there is an adhika month.*
118·1223	147·6530	177·1835	206·7141	236·2447	265·7753	295·3059	324·8365	354·3670
7·904	9·880	11·856	13·832	15·808	17·784	19·760	21·736	23·712

decimals of a day, and moon's anomalistic months.

6	7	8	9	10	11	12	13	14	15
5·9061	6·8905	7·8748	8·8592	9·8435	10·8379	11·8122	12·7966	13·7809	14·7658
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
20·6714	21·6558	22·6401	23·6245	24·6988	25·5932	26·5775	27·5619	28·5462	29·5306

Moon's anomalistic months.

1 month = 27·5545 days.
2 months = 55·1090 days.

12 months = 330·6540
13 months = 358·2085

decimals of a day. (The signs − and + are to be applied to the equation in heavy type and not to the anomaly.)

·21	·22	·23	·24	·25	·26	·27	·28	·29	·30	·31	·32	·33	·34	·35	·36	·37	·38	·39	·40	·41	
2·56	2·70	2·83	2·97	3·11	3·26	3·41	3·56	3·72	3·89	4·05	4·23	4·41	4·60	4·81	5·03	5·27	5·54	5·85	6·28	6·93	
11·64	11·52	11·40	11·28	11·16	11·04	10·91	10·77	10·63	10·49	10·34	10·19	10·02	9·85	9·67	9·46	9·25	9·00	8·71	8·35	7·67	**e For tithis.**
15·92	16·03	16·15	16·27	16·39	16·52	16·65	16·78	16·92	17·06	17·21	17·37	17·53	17·70	17·89	18·09	18·31	18·55	18·84	19·21	19·89	
25·00	24·86	24·72	24·58	24·44	24·29	24·14	23·99	23·83	23·67	23·50	23·33	23·14	22·95	22·74	22·53	22·29	22·02	21·71	21·33	20·62	
2·77	2·92	3·08	3·23	3·39	3·56	3·73	3·91	4·09	4·28	4·49	4·70	4·93	5·18	5·46	5·79	6·19	6·99				
11·42	11·29	11·16	11·02	10·88	10·74	10·59	10·43	10·27	10·09	9·91	9·72	9·51	9·28	9·01	8·71	8·32	7·55				**f For nakshatras.**
16·13	16·26	16·39	16·53	16·67	16·82	16·97	17·12	17·29	17·46	17·64	17·84	18·05	18·27	18·54	18·85	19·23	20·00				
24·78	24·63	24·48	24·32	24·16	23·99	23·82	23·65	23·48	23·27	23·07	22·85	22·62	22·38	22·09	21·78	21·36	20·57				
2·99	3·16	3·33	3·51	3·69	3·88	4·08	4·28	4·50	4·73	4·98	5·26	5·59	5·98	6·56							
11·20	11·06	10·90	10·75	10·59	10·42	10·24	10·06	9·86	9·65	9·41	9·15	8·85	8·47	7·92							**g For yogas.**
16·85	16·50	16·65	16·80	16·97	17·13	17·31	17·50	17·69	17·90	18·14	18·40	18·71	19·08	19·64							
24·56	24·39	24·22	24·05	23·87	23·68	23·48	23·27	23·06	22·83	22·57	22·29	21·96	21·57	21·00							

year and decimals of a day. (The anomalies are entered in ordinary type and the equations, with appropriate signs, in heavy type.)

−·01	−·02	−·03	−·04	−·05	−·06	−·07	−·08	−·09	−·10	−·11	−·12	−·13	−·14	−·15	−·16	−·17	−·175	−·176
85	88	91	95	98	102	105	109	113	116	121	125	130	135	141	148	157	166	169·93
261	257	254	251	247	244	240	237	233	229	225	220	216	211	205	198	188	180	175·63

−·02	−·01	−·00	+·01	+·02	+·03	+·04	+·05	+·06	+·07	+·08	+·09	+·10	+·11	+·12	+·13	+·14	+·150	+·151	+·152
74	77	80·29	85	89	93	97	101	105	109	113	118	123	128	134	141	149	164	167	171·96
272	268	263·92	260	256	252	248	244	240	236	232	227	222	217	211	204	196	181	178	172·95

Ārya siddhānta—Odd years.

	Fraction of day, marking commencement of solar year.	First new moon in solar year.	☾'s anomaly for beginning of solar year.		Fraction of day, marking commencement of solar year.	First new moon in solar year.	☾'s anomaly for beginning of solar year.		Fraction of day, marking commencement of solar year.	First new Moon in solar year.	☾'s anomaly for beginning of solar year.
	n	o	p		n	o	p		n	o	p
1	·25868	18·63903	7·04931	38	·82986	29·07937	19·88238	75	1·40104	9·98913	5·16084
2	·51736	7·74745	14·09862	39	1·08854	18·18780	26·93169	76	·65972	28·62815	12·21015
3	·77604	26·38648	21·14793	40	·34722	7·29624	6·42640	77	·91840	17·73659	19·25946
4	·03472	15·49492	0·64264	41	·60590	25·93526	13·47571	78	1·17708	6·84502	26·30877
5	·29340	4·60335	7·69195	42	·66458	15·04370	20·52502	79	1·43576	25·48405	5 80848
6	·55208	23·24238	14·74126	43	1·12326	4·15214	0·01973	80	·69444	14·59249	12·85279
7	·81076	12·35082	21·79057	44	·38194	22·79116	7·06904	81	·95312	3·70092	19·90210
8	·06944	1·45924	1·28528	45	·64062	11·89959	14·11835	82	1·21180	22·33994	26·95141
9	·32812	20·09827	8·33459	46	·89930	1·90803	21·16766	83	1·47048	11·44838	6·44612
10	·58680	9·20671	15·38390	47	1·15799	19·64705	0·66237	84	·72917	0·55681	13·49543
11	·84549	27·84573	22·43321	48	·41667	8·75549	7·71168	85	·98785	19·19584	20 54474
12	·10417	16·95417	1·92792	49	·67535	27·39452	14·76099	86	1·24653	8·30428	0·03945
13	·36285	6·06260	8·97723	50	·93403	16·50294	21·81030	87	1·50521	26·94329	7·08876
14	·62153	24·70162	16·02654	51	1·19271	5·61138	1·30500	88	·76389	16·05173	14·18807
15	·88021	13·81006	23·07585	52	·45139	24·25041	8·35432	89	1·02257	5·16017	21·18738
16	·13889	2·91850	2·57056	53	·71007	13·35884	15·40363	90	1·28125	23·79919	0·68209
17	·39757	21·55752	9·61987	54	·96875	2·46728	22·45294	91	1·53993	12·90763	7·73140
18	·65625	10·66596	16·66918	55	1·22743	21·10630	1·94764	92	·79861	2·01607	14·78071
19	·91493	29·30498	23·71849	56	·48611	10·21474	8·99695	93	1·05729	20·65508	21·83002
20	·17361	18·41341	3·21320	57	·74479	28·85376	16·04627	94	1·31597	9·76352	1·32474
21	·43229	7·52185	10·26251	58	1·00347	17·96219	28·09558	95	1·57465	28·40254	8·37405
22	·69097	26·16088	17·31182	59	1·26215	7·07063	2·59028	96	·83333	17·51098	15 42 36
23	·94965	15·26930	24·36113	60	·52083	25·70966	9·63959	97	1·09201	6·61942	22·47267
24	·20833	4·37774	3·85584	61	·77951	14·81810	16·68890	98	1·35069	25·25844	1·86738
25	·46701	23·01677	10·90515	62	1·03819	3·92653	23·73822	99	1·60937	14·36687	9·01668
26	·72569	12·12520	17·95446	63	1·29687	22·56555	3·23292	100	·86805	3·47531	16·06600
27	·98437	1·23364	25·00377	64	·55555	11·67399	10·28223	200	·73611	6·95062	4·57738
28	·24305	19·87267	4·49848	65	·81423	0·78243	17·33154	300	·60417	10·42593	20·64332
29	·50174	8·98109	11·54779	66	1·07292	19·42144	24·38086	400	·47222	13·90124	9·15466
30	·76042	27·62012	18·59710	67	1·33160	8·52989	3·87556	500	·34028	17·37655	25·22064
31	1·01910	16·72856	25·64641	68	·59028	27·16891	10·92488	600	·20833	20·85186	13·73203
32	·27778	5·83699	5·14112	69	·84896	16·27734	17·97419	700	·07639	24·32717	2·24342
33	·53646	24·47602	12·19043	70	1·10764	5·38578	25·02350	800	·94444	27·80248	18·30941
34	·79514	13·58446	19·23974	71	1·36632	24·02480	4·51820	900	·81250	1·74720	6·82080
35	1·05382	2·69288	26·28905	72	·62500	13·13323	11·56751	1000	·68055	5·22251	22·88679
36	·31250	21·33191	5·78376	73	·88368	2·24167	18·61682	2000	·36111	10·44502	18·21898
37	·57118	10·44035	12·83307	74	1·14236	20·88070	25·6661	3000	.04166	15·66753	13·55117

q Days counted from March 1

March	Mar. 1 ...	Apr. 1 1	May 1 32	June 1 62	July 1 93	Aug. 1 123	Sep. 1 154	Oct. 1 185	Nov. 1 215	Dec. 1 246	Jan. 1 276	Feb. 1 307	Mar. 1 338	...
r Ghaṭikas ...	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Fraction of day.	·0167	·0333	·0500	·0667	·0833	·1000	·1167	·1333	·1500	·1667	·1833	·2000	·2167	·2333
Ghaṭikas ...	31	32	33	34	35	36	37	38	39	40	41	42	43	44
Fraction of day.	·5167	·5333	·5500	·5667	·5833	·6000	·6167	·6333	·6500	·6667	·6833	·7000	·7167	·7333
Palas ...	1	2	3	4	5	6	7	8	9	10	12	15	17	20
Fraction of day.	·0003	·0005	·0008	·0011	·0014	·0017	·0019	·0022	·0025	·0028	·0033	·0042	·0047	·0055

NAKSHA

s Shortest interval in days, from new moon to ending

Longitude at commencement. Deg.	Min.	Order	Names of nakshatras.	Days.	Order	Ordinarily Vaiśākha I	Order	Ordinarily Jyeshṭha II	Order	Ordinarily Āshāḍha III	Order	Ordinarily Śrāvaṇa IV	Order	Ordinarily Bhādrapada V	Order	Ordinarily Āśvina VI	Order	Ordinarily Kārttika VII
		27	Revati		3	0·9874	5	0·8023	7	0·6172	9	0·4321	11	0·2470	13	0·0620	16	0·8888
0	0	1	Aśvini	1·0119	4	1·9993	6	1·8142	8	1·6291	10	1·4440	12	1·2590	14	1·0739	17	1·9007
13	20	2	Bharani	2·0238	5	3·0112	7	2·8261	9	2·6410	11	2·4560	13	2·2709	15	2·0858	18	2·9126
26	40	3	Kṛittikā	3·0357	6	4·0231	8	3·8380	10	3·6530	12	3·4679	14	3·2828	16	3·0977	19	3·9245
40	0	4	Rohiṇi	4·0476	7	5·0350	9	4·8500	11	4·6649	13	4·4798	15	4·2947	17	4·1096	20	4·9364
53	20	5	Mṛigaśira	5·0595	8	6·0470	10	5·8619	12	5·6768	14	5·4917	16	5·3066	18	5·1215	21	5·9484
66	40	6	Ardrā	6·0715	9	7·0589	11	6·8738	13	6·6887	15	6·5036	17	6·3185	19	6·1334	22	6·9603
80	0	7	Punarvasu	7·0834	10	8·0708	12	7·8857	14	7·7006	16	7·5155	18	7·3304	20	7·1454	23	7·9722
93	20	8	Pushya	8·0953	11	9·0827	13	8·8976	15	8·7125	17	8·5274	19	8·3424	21	8·1573	24	8·9841
106	40	9	Aśleshā	9·1072	12	10·0946	14	9·9095	16	9·7244	18	9·5394	20	9·3543	22	9·1692	25	9·9960
120	0	10	Maghā	10·1191	13	11·1065	15	10·9214	17	10·7364	19	10·5523	21	10·3662	23	10·1811	26	11·0079
133	20	11	Pūrva-Phalguni ...	11·1310	14	12·1184	16	11·9334	18	11·7488	20	11·5632	22	11·3781	24	11·1930	27	12·0198
146	40	12	Uttara-Phalguni ...	12·148	15	13·1304	17	12·9456	19	12·7602	21	12·5751	23	12·3900	25	12·2049	1	13·0318
160	0	13	Hasta	13·1549	16	14·1423	18	13·9572	20	13·7721	22	13·5870	24	13·4019	26	13·2168	2	14·0437
173	20	14	Chitrā	14·1668	17	15·1542	19	14·9691	21	14·7840	23	14·5989	25	14·4138	27	14·2288	3	15·0556
186	40	15	Svāti	15·1787	18	16·1661	20	15·9810	22	15·7959	24	15·6108	26	15·4258	1	15·2407	4	16·0675
200	0	16	Viśākhā	16·1906	19	17·1780	21	16·9929	23	16·8078	25	16·6228	27	16·4377	2	16·2526	5	17·0794
213	20	17	Anurādhā	17·2027	20	18·1899	22	18·0048	24	17·8198	26	17·6347	1	17·4496	3	17·2645	6	18·0913
226	40	18	Jyeshṭhā	18·2144	21	19·2018	23	19·0168	25	18·8317	27	18·6466	2	18·4615	4	18·2764	7	19·1032
240	0	19	Mūla	19·2264	22	20·2138	24	20·0287	26	19·8436	1	19·6585	3	19·4734	5	19·2883	8	20·1151
253	20	20	Pūrva-Āshāḍhā ...	20·2383	23	21·2257	25	21·0406	27	20·8555	2	20·6704	4	20·4853	6	20·3002	9	21·1271
266	40	21	Uttara-Āshāḍhā ...	21·2502	24	22·2376	26	22·0525	1	21·8674	3	21·6823	5	21·4972	7	21·3121	10	22·1390
280	0	22	Śrāvaṇa	22·2621	25	23·2495	27	23·0644	2	22·8793	4	22·6942	6	22·5091	8	22·3241	11	23·1509
293	20	23	Dhanishṭa	23·2740	26	24·2614	1	24·0763	3	23·8912	5	23·7061	7	23·5211	9	23·3360	12	24·1628
306	40	24	Śatabhishaj	24·2859	27	25·2733	2	25·0882	4	24·9031	6	24·7181	8	24·5330	10	24·3479	13	25·1747
320	0	25	Pūrva-Bhadrapadā ...	25·2978	1	26·2852	3	26·1001	5	25·9151	7	25·7300	9	25·5449	11	25·3598	14	26·1866
333	20	26	Uttara-Bhadrapadā ...	26·3098	2	27·2972	4	27·1121	6	26·9270	8	26·7419	10	26·5568	12	26·3717	15	27·1985
346	40	27	Revati	27·3217	3	28·3091	5	28·1240	7	27·9389	9	27·7538	11	27·5687	13	27·3836	16	28·2105
					4	29·3210	6	29·1359	8	28·9508	10	28·7657	12	28·5806	14	28·3955	17	29·2224
															15	29·4075		

YOGAS.

v Shortest interval in days from new moon to

Longitude at commencement. Deg.	Min.	Order	Names of yogas.	Days.	Order	Ordinarily Vaiśākha	Order	Ordinarily Jyeshṭha	Order	Ordinarily Āshāḍha	Order	Ordinarily Śrāvaṇa	Order	Ordinarily Bhādrapada	Order	Ordinarily Āśvina	Order	Ordinarily Kārttika
		27	Vaidhriti		5	0·8959	9	0·5515	13	0·2071	18	0·8042	22	0·4598	26	0·1154	4	0·7124
0	0	1	Vishkamba	0·9415	6	1·8374	10	1·4930	14	1·1486	19	1·7457	23	1·4013	27	1·0568	5	1·6539
13	20	2	Prīti	1·8830	7	2·7789	11	2·4345	15	2·0901	20	2·6872	24	2·3427	1	1·9983	6	2·5954
26	40	3	Āyushmat	2·8345	8	3·7204	12	3·3760	16	3·0316	21	3·6286	25	3·2842	2	2·9398	7	3·5369
40	0	4	Saubhagya	3·7860	9	4·6619	13	4·3175	17	3·9730	22	4·5701	26	4·2257	3	3·8813	8	4·4784
53	20	5	Śobhana	4·7074	10	5·6034	14	5·2589	18	4·9145	23	5·5116	27	5·1672	4	4·8228	9	5·4199
66	40	6	Atigaṇḍa	5·6489	11	6·5449	15	6·2004	19	5·8560	24	6·4531	1	6·1087	5	5·7648	10	6·3614
80	0	7	Sukarman	6·5904	12	7·4863	16	7·1419	20	6·7975	25	7·3946	2	7·0502	6	6·7058	11	7·3029
93	20	8	Dhriti	7·5319	13	8·4278	17	8·0834	21	7·7395	26	8·3361	3	7·9917	7	7·6473	12	8·2444
106	40	9	Śūla	8·4734	14	9·3693	18	9·0249	22	8·6805	27	9·2776	4	8·9332	8	8·5888	13	9·1858
120	0	10	Gaṇḍa	9·4149	15	10·3108	19	9·9664	23	9·6220	1	10·2191	5	9·8747	9	9·5302	14	10·1273
133	20	11	Vriddhi	10·3564	16	11·2523	20	10·9079	24	10·5635	2	11·1656	6	10·8162	10	10·4717	15	11·0688
146	40	12	Dhruva	11·2979	17	12·1938	21	11·8494	25	11·5050	3	12·1020	7	11·7576	11	11·4132	16	12·0103
160	0	13	Vyaghāta	12·2394	18	13·1353	22	12·7909	26	12·4465	4	13·0435	8	12·6991	12	12·3547	17	12·9518
173	20	14	Harshaṇa	13·1808	19	14·0768	23	13·7324	27	13·3879	5	13·9850	9	13·6406	13	13·2962	18	13·8933
186	40	15	Vajra	14·1223	20	15·0183	24	14·6738	1	14·3294	6	14·9265	10	14·5821	14	14·2377	19	14·8348
200	0	16	Siddhi	15·0638	21	15·9597	25	15·6153	2	15·2709	7	15·8680	11	15·5236	15	15·1792	20	15·7763
213	20	17	Vyatipāta	16·0053	22	16·9012	26	16·5568	3	16·2124	8	16·8095	12	16·4651	16	16·1207	21	16·7181
226	40	18	Varīyas	16·9468	23	17·8427	27	17·4983	4	17·1539	9	17·7510	13	17·4066	17	17·0622	22	17·6592
240	0	19	Parigha	17·8883	24	18·7842	1	18·4398	5	18·0954	10	18·6925	14	18·3481	18	18·0037	23	18·6007
253	20	20	Śiva	18·8298	25	19·7257	2	19·3813	6	19·0369	11	19·6340	15	19·2896	19	18·9451	24	19·5422
266	40	21	Siddha	19·7713	26	20·6672	3	20·3228	7	19·9784	12	20·5755	16	20·2310	20	19·8866	25	20·4837
280	0	22	Sādhya	20·7128	27	21·6087	4	21·2643	8	20·9199	13	21·5169	17	21·1725	21	20·8281	26	21·4252
293	20	23	Śubha	21·6543	1	22·5502	5	22·2058	9	21·8614	14	22·4584	18	22·1140	22	21·7696	27	22·3667
306	40	24	Śukla	22·5957	2	23·4917	6	23·1473	10	22·8028	15	23·3999	19	23·0555	23	22·7111	1	23·3082
320	0	25	Brahman	23·5372	3	24·4332	7	24·0887	11	23·7443	16	24·3414	20	23·9970	24	23·6526	2	24·2497
333	20	26	Indra	24·4787	4	25·3746	8	25·0302	12	24·6858	17	25·2829	21	24·9385	25	24·5941	3	25·1912
346	40	27	Vaidhriti	25·4202	5	26·3161	9	25·9717	13	25·6273	18	26·2244	22	25·8800	26	25·5356	4	26·1327
					6	27·2576	10	26·9132	14	26·5688	19	27·1659	23	26·8215	27	26·4771	5	27·0741
					7	28·1991	11	27·8547	15	27·5103	20	28·1074	24	27·7630	1	27·4186	6	28·0156
					8	29·1406	12	28·7962	16	28·4518	21	29·0489	25	28·7045	2	28·3600	7	28·9571
									17	29·3933					3	29·3014		

q Days counted from April 1

April ...	Apr. 1	May 1	June 1	July 1	Aug. 1	Sep. 1	Oct. 1	Nov. 1	Dec. 1	Jan. 1	Feb. 1	Mar. 1
	1	31	62	92	123	154	184	215	245	276	307	335
										Leap Year, Ap. 336		

15 ·2500	**16** ·2667	**17** ·2833	**18** ·3000	**19** ·3167	**20** ·3333	**21** ·3500	**22** ·3667	**23** ·3833	**24** ·4000	**25** ·4167	**26** ·4333	**27** ·4500	**28** ·4667	**29** ·4833	**30** ·5000
45 ·7500	**46** ·7667	**47** ·7833	**48** ·8000	**49** ·8167	**50** ·8333	**51** ·8500	**52** ·8667	**53** ·8833	**54** ·9000	**55** ·9167	**56** ·9333	**57** ·9500	**58** ·9667	**59** ·9833	**60** 1·0000
22 ·0061	**25** ·0069	**27** ·0075	**30** ·0083	**32** ·0089	**35** ·0097	**37** ·0103	**40** ·0111	**42** ·0117	**45** ·0125	**47** ·0130	**50** ·0139	**52** ·0144	**55** ·0153	**57** ·0158	**60** ·0167

TRAS.

moment of each nakshatra.

Order	Ordinarily Mārgaśirsha	Order	Ordinarily Pausha	Order	Ordinarily Māgha	Order	Ordinarily Phālguna	Order	Chaitra, when no Adhika Masa	Order	Chaitra, when there is Adhika Masa
	VIII		**IX**		**X**		**XI**		**XII**		**XIII**
18	0·7037	**20**	0·5186	**22**	0·3335	**24**	0·1484	**27**	0·9753	**2**	0·7902
19	1·7156	**21**	1·5305	**23**	1·3454	**25**	1·1604	**1**	1·9872	**3**	1·8021
20	2·7275	**22**	2·5424	**24**	2·3574	**26**	2·1723	**2**	2·9991	**4**	2·8140
21	3·7384	**23**	3·5544	**25**	3·3693	**27**	3·1842	**3**	4·0110	**5**	3·8259
22	4·7514	**24**	4·5663	**26**	4·3812	**1**	4·1961	**4**	5·0229	**6**	4·8378
23	5·7633	**25**	5·5782	**27**	5·3931	**2**	5·2080	**5**	6·0348	**7**	5·8498
24	6·7752	**26**	6·5901	**1**	6·4050	**3**	6·2199	**6**	7·0468	**8**	6·8617
25	7·7871	**27**	7·6020	**2**	7·4169	**4**	7·2318	**7**	8·0587	**9**	7·8736
26	8·7990	**1**	8·6139	**3**	8·4288	**5**	8·2438	**8**	9·0706	**10**	8·8855
27	9·8109	**2**	9·6258	**4**	9·4408	**6**	9·2557	**9**	10·0825	**11**	9·8974
1	10·8228	**3**	10·6378	**5**	10·4527	**7**	10·2676	**10**	11·0944	**12**	10·9093
2	11·8348	**4**	11·6497	**6**	11·4646	**8**	11·2795	**11**	12·1063	**13**	11·9212
3	12·8467	**5**	12·6616	**7**	12·4765	**9**	12·2914	**12**	13·1182	**14**	12·9332
4	13·8586	**6**	13·6735	**8**	13·4884	**10**	13·3033	**13**	14·1302	**15**	13·9451
5	14·8705	**7**	14·6854	**9**	14·5003	**11**	14·3152	**14**	15·1421	**16**	14·9570
6	15·8824	**8**	15·6973	**10**	15·5122	**12**	15·3272	**15**	16·1540	**17**	15·9689
7	16·8943	**9**	16·7092	**11**	16·5242	**13**	16·3391	**16**	17·1659	**18**	16·9808
8	17·9062	**10**	17·7212	**12**	17·5361	**14**	17·3510	**17**	18·1778	**19**	17·9927
9	18·9181	**11**	18·7331	**13**	18·5480	**15**	18·3629	**18**	19·1897	**20**	19·0046
10	19·9301	**12**	19·7450	**14**	19·5599	**16**	19·3748	**19**	20·2016	**21**	20·0165
11	20·9420	**13**	20·7569	**15**	20·5718	**17**	20·3867	**20**	21·2135	**22**	21·0285
12	21·9539	**14**	21·7688	**16**	21·5837	**18**	21·3986	**21**	22·2255	**23**	22·0404
13	22·9658	**15**	22·7807	**17**	22·5956	**19**	22·4106	**22**	23·2374	**24**	23·0523
14	23·9777	**16**	23·7926	**18**	23·6076	**20**	23·4225	**23**	24·2493	**25**	24·0642
15	24·9896	**17**	24·8046	**19**	24·6195	**21**	24·4344	**24**	25·2612	**26**	25·0761
16	26·0015	**18**	25·8165	**20**	25·6314	**22**	25·4463	**25**	26·2731	**27**	26·0880
17	27·0135	**19**	26·8284	**21**	26·6433	**23**	26·4582	**26**	27·2850	**1**	27·0999
18	28·0254	**20**	27·8403	**22**	27·6552	**24**	27·4701	**27**	28·2969	**2**	28·1119
19	29·0373	**21**	28·8522	**23**	28·6671	**25**	28·4820	**1**	29·3089	**3**	29·1238
						26	29·4939				

ending moment of yogas.

Order	Ordinarily Mārgaśirsha	Order	Ordinarily Pausha	Order	Ordinarily Māgha	Order	Ordinarily Phālguna	Order	Chaitra when no Adhika Masa	Order	Chaitra when there is Adhika Masa
8	0·3680	**12**	0·0236	**17**	0·6207	**21**	0·2763	**26**	0·8734	**3**	0·5290
9	1·3095	**13**	0·9651	**18**	1·5622	**22**	1·2178	**27**	1·8149	**4**	1·4704
10	2·2510	**14**	1·9066	**19**	2·5037	**23**	2·1593	**1**	2·7563	**5**	2·4119
11	3·1925	**15**	2·8481	**20**	3·4452	**24**	3·1008	**2**	3·6978	**6**	3·3534
12	4·1340	**16**	3·7896	**21**	4·3867	**25**	4·0422	**3**	4·6393	**7**	4·2949
13	5·0755	**17**	4·7311	**22**	5·3281	**26**	4·9837	**4**	5·5808	**8**	5·2364
14	6·0170	**18**	5·6726	**23**	6·2696	**27**	5·9252	**5**	6·5223	**9**	6·1789
15	6·9585	**19**	6·6140	**24**	7·2111	**1**	6·8667	**6**	7·4638	**10**	7·1194
16	7·8899	**20**	7·5555	**25**	8·1526	**2**	7·8082	**7**	8·4053	**11**	8·0609
17	8·8414	**21**	8·4970	**26**	9·0941	**3**	8·7497	**8**	9·3468	**12**	9·0024
18	9·7829	**22**	9·4385	**27**	10·0356	**4**	9·6912	**9**	10·2883	**13**	9·9439
19	10·7244	**23**	10·3800	**1**	10·9771	**5**	10·6327	**10**	11·2298	**14**	10·8853
20	11·6659	**24**	11·3215	**2**	11·9186	**6**	11·5742	**11**	12·1712	**15**	11·8268
21	12·6074	**25**	12·2630	**3**	12·8601	**7**	12·5157	**12**	13·1127	**16**	12·7683
22	13·5489	**26**	13·2045	**4**	13·8015	**8**	13·4571	**13**	14·0542	**17**	13·7098
23	14·4904	**27**	14·1460	**5**	14·7430	**9**	14·3986	**14**	14·9957	**18**	14·6513
24	15·4319	**1**	15·0774	**6**	15·6845	**10**	15·3401	**15**	15·9372	**19**	15·5928
25	16·3733	**2**	16·0289	**7**	16·6260	**11**	16·2816	**16**	16·8787	**20**	16·5343
26	17·3148	**3**	16·9704	**8**	17·5675	**12**	17·2231	**17**	17·8202	**21**	17·4758
27	18·2563	**4**	17·9119	**9**	18·5090	**13**	18·1646	**18**	18·7617	**22**	18·4173
1	19·1978	**5**	18·8534	**10**	19·4505	**14**	19·1061	**19**	19·7032	**23**	19·3588
2	20·1393	**6**	19·7949	**11**	20·3920	**15**	20·0476	**20**	20·6446	**24**	20·3002
3	21·0808	**7**	20·7364	**12**	21·3335	**16**	20·9891	**21**	21·5861	**25**	21·2417
4	22·0223	**8**	21·6779	**13**	22·2750	**17**	21·9305	**22**	22·5276	**26**	22·1832
5	22·9638	**9**	22·6194	**14**	23·2164	**18**	22·8720	**23**	23·4691	**27**	23·1247
6	23·9053	**10**	23·5609	**15**	24·1579	**19**	23·8135	**24**	24·4101	**1**	24·0662
7	24·8468	**11**	24·5023	**16**	25·0994	**20**	24·7550	**25**	25·3521	**2**	25·0087
8	25·7882	**12**	25·4438	**17**	26·0409	**21**	25·6965	**26**	26·2936	**3**	25·9492
9	26·7297	**13**	26·3853	**18**	26·9824	**22**	26·6380	**27**	27·2351	**4**	26·8907
10	27·6712	**14**	27·3268	**19**	27·9239	**23**	27·5795	**1**	28·1766	**5**	27·8322
11	28·6127	**15**	28·2683	**20**	28·8654	**24**	28·5210	**2**	29·1181	**6**	28·7736
		16	29·2098			**25**	29·4625				

Annual correction.

Argument :—Date of appearance of 1st new moon in each solar year according to Table X.

The correction corresponding to the decimal portion of the argument should be subtracted from the nakshatra or yoga correction corresponding to the integral portion; thus the nakshatra correction corresponding to an argument 28·53 = 0·11 *minus* ·04 = 0·07.

NAKSHATRAS.

Arg.	Corrn. t	Arg.	Corrn. u	Arg.	Corrn. u	Arg.	Corrn. u	Arg.	Corrn. u
0	2·20890	**·01**	·00075	**·30**	·02244	**·59**	·04413	**·88**	·06582
1	2·13410	**·02**	·00150	**·31**	·02319	**·60**	·04488	**·89**	06657
2	2·05930	**·03**	·00224	**·32**	·02394	**·61**	·04563	**·90**	·06732
3	1·98450	**·04**	·00299	**·33**	·02468	**·62**	·04638	**·91**	.06807
4	1·90970	**·05**	·00374	**·34**	·02543	**·63**	·04712	**·92**	·06882
5	1·83490	**·06**	·00449	**·35**	.02618	**·64**	·04787	**·93**	·06956
6	1·76010	**·07**	·00524	**·36**	·02693	**·65**	·04862	**·94**	·07031
7	1·68531	**·08**	·00598	**·37**	·02768	**·66**	·04937	**·95**	·07106
8	1·61049	**·09**	·00673	**·38**	·02842	**·67**	·05012	**·96**	·07181
9	1·53569	**·10**	·00748	**·39**	·02917	**·68**	·05086	**·97**	·07256
10	1·46089	**·11**	·00823	**·40**	·02992	**·69**	·05161	**·98**	·07330
11	1·38609	**·12**	·00898	**·41**	·03067	**·70**	·05236	**·99**	·07405
12	1·31129	**·13**	·00972	**·42**	·03142	**·71**	·05311		
13	1·23649	**·14**	·01047	**·43**	·03216	**·72**	·05386		
14	1·16169	**·15**	·01122	**·44**	·03291	**·73**	·05460		
15	1·08689	**·16**	·01197	**·45**	·03366	**·74**	·05535		
16	1·01209	**·17**	·01272	**·46**	·03441	**·75**	·05610		
17	0·93729	**·18**	·01346	**·47**	·03516	**·76**	·05685		
18	0·86249	**·19**	·01421	**·48**	·03590	**·77**	·05760		
19	0·78769	**·20**	·01496	**·49**	·03665	**·78**	·05834		
20	0·71288	**·21**	·01571	**·50**	·03740	**·79**	·05909		
21	0·63808	**·22**	·01646	**·51**	·03815	**·80**	·05984		
22	0·56328	**·23**	·01720	**·52**	·03890	**·81**	·06059		
23	0·48848	**·24**	·01795	**·53**	·03964	**·82**	·06134		
24	0·41368	**·25**	·01870	**·54**	·04039	**·83**	·06208		
25	0·33888	**·26**	·01945	**·55**	·04114	**·84**	·06283		
26	0·26408	**·27**	·02020	**·56**	·04189	**·85**	·06358		
27	0·18928	**·28**	·02094	**·57**	·04264	**·86**	·06433		
28	0·11448	**·29**	·02169	**·58**	·04338	**·87**	·06508		
29	0·03968								

YOGAS.

See note on ANNUAL CORRECTION *supra*.

w		x		x		x		x	
0	4·11036	**·01**	·00139	**·30**	·04176	**·59**	·08212	**·88**	·12249
1	3·97117	**·02**	·00278	**·31**	·04315	**·60**	·08351	**·89**	·12388
2	3·83198	**·03**	·00417	**·32**	·04454	**·61**	·08491	**·90**	·12527
3	3·69279	**·04**	·00557	**·33**	·04598	**·62**	·08630	**·91**	·12666
4	3·55360	**·05**	·00696	**·34**	·04732	**·63**	·08769	**·92**	·12805
5	3·41441	**·06**	·00835	**·35**	·04872	**·64**	·08908	**·93**	·12945
6	3·27522	**·07**	·00974	**·36**	·05011	**·65**	·09047	**·94**	·13084
7	3·13603	**·08**	·01113	**·37**	·05150	**·66**	·09186	**·95**	·13223
8	2·99684	**·09**	·01253	**·38**	·05289	**·67**	·09326	**·96**	·13362
9	2·85765	**·10**	·01392	**·39**	·05428	**·68**	·09465	**·97**	·13501
10	2·71846	**·11**	·01530	**·40**	·05568	**·69**	·09604	**·98**	·13641
11	2·57927	**·12**	·01670	**·41**	·05707	**·70**	·09743	**·99**	·13780
12	2·44008	**·13**	·01809	**·42**	·05846	**·71**	·09882		
13	2·30089	**·14**	·01949	**·43**	·05985	**·72**	·10022		
14	2·16170	**·15**	·02088	**·44**	·06124	**·73**	·10161		
15	2·02251	**·16**	·02227	**·45**	·06263	**·74**	·10300		
16	1·88332	**·17**	·02366	**·46**	·06493	**·75**	·10489		
17	1·74418	**·18**	·02505	**·47**	·06542	**·76**	·10578		
18	1·60494	**·19**	·02645	**·48**	·06681	**·77**	·10798		
19	1·46575	**·20**	·02784	**·49**	·06820	**·78**	·10837		
20	1·32656	**·21**	·02923	**·50**	·06959	**·79**	·10976		
21	1·18737	**·22**	·03063	**·51**	·07098	**·80**	.11115		
22	1·04818	**·23**	·03291	**·52**	·07238	**·81**	·11274		
23	0·90899	**·24**	·03340	**·53**	·07377	**·82**	·11413		
24	0·76980	**·25**	·03480	**·54**	·07516	**·83**	·11553		
25	0·63061	**·26**	·03619	**·55**	·07655	**·84**	·11692		
26	0·49142	**·27**	·03758	**·56**	·07795	**·85**	·11831		
27	0·35223	**·28**	·03897	**·57**	·07934	**·86**	·11970		
28	0·21304	**·29**	·04036	**·58**	·08073	**·87**	·12109		
29	0·07385								

y Calendar to be used with Table II, as directed in specimen problems, for ascertaining the A.D. month and day corresponding to any solar date, lunar tithi, nakshatra, yoga or karana.

Day of solar year.	Tithi No.	Ending moment of tithi.	☾'s An. for each tithi.

Vaiśākha.

0	·9843	1	0·984
1	·9687	2	1·969
2	·9530	3	2·953
3	·9374	4	3·937
4	·9217	5	4·921
5	·9061	6	5·906
6	·8904	7	6·890
7	·8748	8	7·875
8	·8592	9	8·859
9	·8435	10	9·843
10	·8279	11	10·827
11	·8122	12	11·812
12	·7966	13	12·797
13	·7809	14	13·781
14	·7652	15	14·765
15	·7496	1	15·750
16	·7340	2	16·734
17	·7183	3	17·718
18	·7027	4	18·703
19	·6870	5	19·687
20	·6714	6	20·671
21	·6557	7	21·656
22	·6401	8	22·640
23	·6244	9	23·624
24	·6088	10	24·609
25	·5932	11	25·593
26	·5775	12	26·577
27	·5619	13	0·007
28	·5462	14	0·992
29	·5306	15	1·976

Jyeshṭha.

30	·5149	1	2·960
31	·4993	2	3·945
32	·4836	3	4·929
33	·4680	4	5·913
34	·4523	5	6·898
35	·4367	6	7·882
36	·4210	7	8·866
37	·4054	8	9·851
38	·3898	9	10·835
39	·3741	10	11·819
40	·3585	11	12·804
41	·3428	12	13·788
42	·3272	13	14·773
43	·3115	14	15·757
44	·2959	15	16·741
45	·2802	1	17·726
46	·2646	2	18·710
47	·2489	3	19·694
48	·2333	4	20·679
49	·2176	5	21·663
50	·2020	6	22·647
51	·1863	7	23·632
52	·1707	8	24·616
53	·1551	9	25·600
54	·1394	10	26·585
55	·1238	11	0·015
56	·1081	12	0·999
57	·0925	13	1·983
58	·0768	14	2·968
59	·0612	15	3·952

Āshāḍha.

60	·0455	1	4·936
61	·0299	2	5·921
62	·0142	3	6·905
62	·9986	4	7·889
63	·9829	5	8·874

Āshāḍha—*cont.*

64	·9673	6	9·858
65	·9516	7	10·842
66	·9360	8	11·827
67	·9203	9	12·811
68	·9047	10	13·795
69	·8891	11	14·780
70	·8734	12	15·764
71	·8578	13	16·749
72	·8421	14	17·733
73	·8265	15	18·717
74	·8108	1	19·702
75	·7952	2	20·686
76	·7795	3	21·670
77	·7639	4	22·655
78	·7482	5	23·639
79	·7326	6	24·623
80	·7169	7	25·608
81	·7013	8	26·592
82	·6856	9	0·022
83	·6700	10	1·006
84	·6543	11	1·991
85	·6387	12	2·975
86	·6231	13	3·959
87	·6074	14	4·944
88	·5918	15	5·928

Śrāvaṇa.

89	·5761	1	6·912
90	·5605	2	7·897
91	·5448	3	8·881
92	·5292	4	9·865
93	·5135	5	10·850
94	·4979	6	11·834
95	·4822	7	12·818
96	·4666	8	13·803
97	·4509	9	14·787
98	·4353	10	15·771
99	·4196	11	16·756
100	·4040	12	17·740
101	·3883	13	18·725
102	·3727	14	19·709
103	·3571	15	20·693
104	·3414	1	21·678
105	·3258	2	22·662
106	·3101	3	23·646
107	·2945	4	24·631
108	·2788	5	25·615
109	·2632	6	26·599
110	·2475	7	0·029
111	·2319	8	1·013
112	·2162	9	1·998
113	·2006	10	2·982
114	·1849	11	3·966
115	·1693	12	4·951
116	·1536	13	5·935
117	·1380	14	6·920
118	·1223	15	7·904

Bhādrapada.

119	·1067	1	8·888
120	·0911	2	9·873
121	·0754	3	10·857
122	·0598	4	11·841
123	·0441	5	12·826
124	·0285	6	13·810
125	·0128	7	14·794
125	·9972	8	15·779
126	·9815	9	16·763
127	·9659	10	17·747

Bhādrapada—*cont.*

128	·9502	11	18·732
129	·9346	12	19·716
130	·9189	13	20·700
131	·9033	14	21·685
132	·8876	15	22·669
133	·8720	1	23·654
134	·8563	2	24·638
135	·8407	3	25·622
136	·8251	4	26·607
137	·8094	5	0·036
138	·7938	6	1·021
139	·7781	7	2·005
140	·7625	8	2·989
141	·7468	9	3·974
142	·7312	10	4·958
143	·7155	11	5·942
144	·6999	12	6·927
145	·6842	13	7·911
146	·6686	14	8·896
147	·6529	15	9·880

Āśvina.

148	·6373	1	10·864
149	·6216	2	11·849
150	·6060	3	12·833
151	·5904	4	13·817
152	·5747	5	14·802
153	·5591	6	15·786
154	·5434	7	16·770
155	·5278	8	17·755
156	·5121	9	18·739
157	·4965	10	19·728
158	·4808	11	20·708
159	·4652	12	21·692
160	·4495	13	22·676
161	·4339	14	23·661
162	·4182	15	24·645
163	·4026	1	25·630
164	·3869	2	26·614
165	·3713	3	0·044
166	·3556	4	1·028
167	·3400	5	2·012
168	·3244	6	2·997
169	·3087	7	3·981
170	·2931	8	4·965
171	·2774	9	5·950
172	·2618	10	6·934
173	·2461	11	7·918
174	·2305	12	8·903
175	·2148	13	9·887
176	·1992	14	10·872
177	·1835	15	11·856

Kārttika.

178	·1679	1	12·840
179	·1522	2	13·825
180	·1366	3	14·809
181	·1209	4	15·793
182	·1053	5	16·778
183	·0896	6	17·762
184	·0740	7	18·746
185	·0584	8	19·731
186	·0427	9	20·715
187	·0271	10	21·699
188	·0114	11	22·684
188	·9958	12	23·668
189	·9801	13	24·652
190	·9645	14	25·637
191	·9488	15	26·621

Kārttika—*cont.*

192	·9332	1	0·051
193	·9175	2	1·035
194	·9019	3	2·020
195	·8862	4	3·004
196	·8706	5	3·988
197	·8549	6	4·973
198	·8393	7	5·957
199	·8236	8	6·941
200	·8080	9	7·926
201	·7924	10	8·910
202	·7767	11	9·894
203	·7611	12	10·879
204	·7454	13	11·863
205	·7298	14	12·848
206	·7141	15	13·832

Mārgaśīrsha.

207	·6985	1	14·816
208	·6828	2	15·801
209	·6672	3	16·785
210	·6515	4	17·769
211	·6359	5	18·754
212	·6202	6	19·738
213	·6046	7	20·722
214	·5889	8	21·707
215	·5733	9	22·691
216	·5576	10	23·675
217	·5420	11	24·660
218	·5264	12	25·644
219	·5107	13	26·628
220	·4951	14	0·058
221	·4794	15	1·043
222	·4638	1	2·027
223	·4481	2	3·011
224	·4325	3	3·996
225	·4168	4	4·980
226	·4012	5	5·964
227	·3855	6	6·949
228	·3699	7	7·933
229	·3542	8	8·917
230	·3386	9	9·902
231	·3229	10	10·886
232	·3073	11	11·870
233	·2916	12	12·855
234	·2760	13	13·839
235	·2604	14	14·824
236	·2447	15	15·808

Pausha.

237	·2291	1	16·792
238	·2134	2	17·777
239	·1978	3	18·761
240	·1821	4	19·745
241	·1665	5	20·730
242	·1508	6	21·714
243	·1352	7	22·698
244	·1195	8	23·683
245	·1039	9	24·667
246	·0882	10	25·651
247	·0726	11	26·636
248	·0569	12	0·065
249	·0413	13	1·050
250	·0257	14	2·034
251	·0108	15	3·019
251	·9944	1	4·003
252	·9787	2	4·987
253	·9631	3	5·972
254	·9474	4	6·956
255	·9318	5	7·940

Pausha—*cont.*

256	·9161	6	8·925
257	·9005	7	9·909
258	·8848	8	10·893
259	·8692	9	11·878
260	·8535	10	12·862
261	·8379	11	13·846
262	·8222	12	14·831
263	·8066	13	15·815
264	·7909	14	16·799
265	·7753	15	17·784

Māgha.

266	·7597	1	18·768
267	·7440	2	19·753
268	·7284	3	20·737
269	·7127	4	21·721
270	·6971	5	22·706
271	·6814	6	23·690
272	·6658	7	24·674
273	·6501	8	25·659
274	·6345	9	26·643
275	·6188	10	0·078
276	·6032	11	1·057
277	·5875	12	2·041
278	·5719	13	3·026
279	·5562	14	4·010
280	·5406	15	4·995
281	·5249	1	5·979
282	·5093	2	6·963
283	·4937	3	7·948
284	·4780	4	8·932
285	·4624	5	9·916
286	·4467	6	10·901
287	·4311	7	11·885
288	·4154	8	12·869
289	·3998	9	13·854
290	·3841	10	14·838
291	·3685	11	15·822
292	·3528	12	16·807
293	·3372	13	17·791
294	·3215	14	18·775
295	·3059	15	19·760

Phālguna.

296	·2902	1	20·744
297	·2746	2	21·729
298	·2589	3	22·713
299	·2433	4	23·697
300	·2277	5	24·682
301	·2120	6	25·666
302	·1964	7	26·650
303	·1807	8	0·080
304	·1651	9	1·064
305	·1494	10	2·049
306	·1338	11	3·033
307	·1181	12	4·017
308	·1025	13	5·002
309	·0868	14	5·986
310	·0712	15	6·971
311	·0555	1	7·955
312	·0399	2	8·939
313	·0242	3	9·924
314	·0086	4	10·908
314	·9929	5	11·892
315	·9773	6	12·877
316	·9617	7	13·861
317	·9460	8	14·845
318	·9304	9	15·830
319	·9147	10	16·814

Phālguna—*cont.*

320	·8991	11	17·798
321	·8834	12	18·783
322	·8678	13	19·767
323	·8521	14	20·751
324	·8365	15	21·736

Chaitra (when there is no adhika masa).

325	·8208	1	22·720
326	·8052	2	23·705
327	·7895	3	24·689
328	·7739	4	25·673
329	·7582	5	26·658
330	·7426	6	0·087
331	·7269	7	1·072
332	·7113	8	2·056
333	·6957	9	3·040
334	·6800	10	4·025
335	·6644	11	5·009
336	·6487	12	5·993
337	·6331	13	6·978
338	·6174	14	7·962
339	·6018	15	8·947
340	·5861	1	9·931
341	·5705	2	10·915
342	·5548	3	11·900
343	·5392	4	12·884
344	·5235	5	13·868
345	·5079	6	14·853
346	·4922	7	15·837
347	·4766	8	16·821
348	·4610	9	17·806
349	·4453	10	18·790
350	·4297	11	19·774
351	·4140	12	20·759
352	·3984	13	21·743
353	·3827	14	22·727
354	·3671	15	23·712

Chaitra (when there is adhika masa).

355	·3514	1	24·696
356	·3358	2	25·681
357	·3201	3	26·665
358	·3045	4	0·095
359	·2888	5	1·079
360	·2732	6	2·063
361	·2575	7	3·048
362	·2419	8	4·032
363	·2262	9	5·016
364	·2106	10	6·001
365	·1950	11	6·985
366	·1793	12	7·969
367	·1637	13	8·954
368	·1480	14	9·938
369	·1324	15	10·923
370	·1167	1	11·907
371	·1011	2	12·891
372	·0854	3	13·876
373	·0698	4	14·860
374	·0541	5	15·844
375	·0385	6	16·829
376	·0228	7	17·813
377	·0072	8	18·797
377	·9915	9	19·782
378	·9759	10	20·766
379	·9602	11	21·750
380	·9446	12	22·735
381	·9290	13	23·719
382	·9133	14	24·703
383	·8977	15	25·688

BRAHMA SIDDHÂNTA AND SIDDHÂNTA ŚIROMAṆI EYE-TABLE—Specimen problems.

This *eye-table* **alone** will enable any one to *solve correctly, to four places of decimals of a day* and by a single working, any problem in *solar dates, nakshatras or week days* for *1,500 years*, i.e., *from* A.D. 400 to A.D. 2000 by the Brahma Siddhânta and *from* A.D. 900 to A.D. 2400 by the Siddhânta Śiromaṇi. The tables of equations are given to two places of decimals in the abridged sections **a** to **i** of the *eye-table*—see next page—and to *four places* of decimals in the unabridged sections **a** to **i** of the same table, pages 197 to 194 below.

The computation of the ending moment, whether of a tithi or of a nakshatra or of a yoga, always comprises four processes: (1) to find the mean ending moment, (2) to find the anomaly or anomalies for that moment, (3) to find the equation or equations corresponding to the anomaly or anomalies, and (4) to add together the mean ending moment and the equation or equations.

Problem I.—Required to find the ending moment, by Brahma Siddhânta, of Âshâḍha, Śukla 13, A.D. 484. ***Nine stages*** **(1) to (11).**

Commencement of solar year. Col. 1.	Days in solar year or sun's anomaly. Col. 2.	Moon's anomaly. Col. 3.
A.D. 400 ... ... Mar. 16·61677 **k** 84 years ... ... 78874 **m** A.D. 484 ... ... Mar. 17·32552 **(1)**	1st new moon in solar year: A.D. 400 ... 24·70541 **l**; 84 years ... + ·38501 **o**; A.D. 484 ... 25·27441 **(2)** *Add for* Âshâḍha new moon + 59·0612 **b** = 12 tithis ... + 11·9122 **d** 99·1476 **(4)** *Add* sum of ☉'s & ☾'s equs. + ·3641 **(9)** 99·5119 *Add* commencement of solar year, A.D. 484 ... Mar. 17·3255 **(1)** Mar. 113·8374 **(10)**	29·4106 **m** 13·4979 **p** 25·2744 **(2)** (1st N.M. in S.Y.). Sir 1·339 — 55·1090 (2 anom. months). 4·075 **(3)** (☾'s An. at 1st N.M. in S.Y.). +3·962 **c** +11·612 **d** 19·669 **(5)** — ·947 (☉'s equation) **h (6)** 19·792 **(7)** ☉'s eqn. for 99·15 d. **(4)** + ·41 [☾'s eqn. for 19·64 d. **(5)**] or 99·56 d. = — ·0466 **h (6)** ☾'s eqn. for 19·792 d. **(7)** = ... + ·4107 **e (8)** Sum of ☉'s and ☾'s eqns. + ·3641 **(9)**

Note how stages **(1)**, **(2)**, **(3)**, **(4)**, **(5)**, **(6)**, **(7)**, **(8)** and **(9)** are successively arrived at, and then add **(4)**, **(9)** and **(1)**, as shown in column 2.

The 99rd day from March 1 is, by *eye-table*, June 1, ... **q** ... the 113th day from March 1 is, by *eye-table*, June 21.

For the *week day* of 21 June, A.D. 484, we have, by *eye-table* **j**, 2 + 0 + 2 + 21 = 25, 26, divided by 7, leaves remainder 5 = **Thursday** — and ·3774 of a day is 50 ghaṭikas and 15 palas.

(11) — This ended on Thursday **21 June, A.D. 484, at 50 ghaṭikas 15 palas** after mean sunrise, which is identical with Mr. Dikshit's result in Introduction to *Fleet's Gupta Inscriptions* (1888), p. 157.

Problem II.—Required the ending moment by Siddhânta Śiromaṇi of the same tithi, Âshâḍha, Śukla 13, A.D. 484.

The process and details are the same as those given in example 1 for a tithi by Brahma siddhânta, except that (1) **k, l, m** are slightly different as will be seen from the *eye-table*, (2) **o** and **p** present minute differences, also explained in the *eye-table* and (3) the sun's anomaly in days has to be diminished by the following quantities, before finding out the equation. For each Kaliyuga century in the first line below, make the corresponding deduction from ☉'s An. shown in the second line:—

E.Y. 3000, 3100, 3200, 3300, 3400, 3500, 3600, 3700, 3800, 3900, 4000, 4100, 4200, 4300, 4400, 4500, 4600, 4700, 4800, 4900, 5000
−·73, −·76, −·79, −·82, −·85, −·88, −·91, −·94, −·97, −1·00, −1·03, −1·06, −1·09, −1·12, −1·15, −1·18, 1·21, −1·24, −1·27, −1·30, −1·33 days.

For E.Y. 3585 = A.D. 484, we deduct ·90 day from sun's anomaly, according to the above table.

The working for a Siddhânta Śiromaṇi tithi is as follows:—

Commencement of solar year. Col. 1.	☉'s anomaly. Col. 2.	☾'s Anom. days. Col. 3.
A.D. 400 ... ... Mar. 16·6112 **k** 84 years ... ... 7087 **m** A.D. 484 ... ... Mar. 17·3119 **(1)** ☉'s eqn. for 16·71 d., i.e., for 99·20 d. **(4)** — ·990 d.* + ·41 d. [☾'s eqn. for 19·618 d.] ... — ·0489 **h (5)** * ☉'s An. 99·20 d. **(4)** should be diminished by ·990 d. for E.Y. 3500 to 3600 acc. to Siddhânta Śiromaṇi. See note supra. ☾'s eqn. for 19·774 d. **(6)** ... ... = + ·4106 **e (7)** *Add* **(5)** and **(7)** ... + ·3657 **(8)**	24·7915 **l** 0·5072 **o** 25·2990 **(2)** *Add* for Âshâḍha new moon ... 59·0612 **b** *Add* for 12 tithis ... ... 11·9122 **d** *Add* **(2)**, **b** and **d** 99·2724 **(4)** ... + ·3657 **(8)** Mar. 17·3119 **(1)** *Add* **(4)**, **(8)** and **(1)** ... Mar. 113·9550 **(9)**	29·3880 **m** 13·4971 **p** 25·3290 **(2)** 59·1641 [**m** + **p** + **(2)**] — 55·110 (2 anom. months) 4·054 **(3)** (☾'s An. at 1st N.M. S.Y.) 3·962 **c** 11·812 **d** 19·818 [**(3)** + **c** + **d**]. ☾'s eqn. for this is + ·41. — ·044 [☉'s eqn. **h (5)**] 19·774 **(6)**

Note how stages **(1)**, **(2)**, **(3)**, **(4)**, **(5)**, **(6)**, **(7)**, **(8)** are successively arrived at, and then add **(1)**, **(4)** and **(8)**, as shown in column 2.

Result **(9)**, Mar. 113·9550, reduced to day of month, ghaṭikas and palas, becomes Thursday (5) **June 21, 9 53 ghaṭikas, 21 palas** after mean sunrise, which is identical with Mr. Dikshit's result in Introduction to *Fleet's Gupta Inscriptions*, p. 157 ... ... **(10)**

Problem III.—Required the ending moment by Brahma Siddhânta of No. 17 Anurâdhâ Nakshatra in June, A.D. 484. ***Stages of work*** **I to IV**

	Days.	☾'s Anom. days.
Âshâḍha new moon, A.D. 484 (Table II, p. 218, and footnote)	June 9·66	4·07 3·96 [**(3)** + **c**]
Shortest interval from Âshâḍha new moon to No. 17 Anurâdhâ Nakshatra	+ 10·53 **s**	+ 10·53 **s**
Vâk correction for A.D. 484–85 is that corresponding to 25·27 or 0·34 **(t)** minus ·02 **(u)** ...	+ ·32 **I**	+ ·32 **(I)**
(f) (☾'s Naksh. eqn. for Anom. of 18·52 **(II)** days, is	June 20·62 **(III)** + ·34 **(f)** June 20·96 **(IV)**	18·87 **(II)**

(IV) Nakshatra Anurâdhâ (No. 17) ended on Wednesday 5 20 June, A.D. 484, at 96, i.e., 52 ghaṭ. **(r)** after mean sunrise.

Problem IV.—Required the ending moment by Brahma Siddhânta of Yoga Śukla (No. 24) on June, A.D. 484. ***Stages of work*** **A to G.**

	Days.	☉'s Anom. days.	☾'s Anom. days.
Âshâḍha new moon, A.D. 484 (Table II, p. 218, and footnote)	June 9·66	25·28 **(3)**	4·07 **(3)**
Shortest interval from Âshâḍha new moon to No. 24 Yoga Śukla **v**	+ 10·57	+ 10·05 **b** + 10·57 **v**	+ ·95 **c** + 10·57 **v**
Yoga correction for A.D. 484–85 is that corresponding to an argument of 25·27 days, i.e., 0·63 **w** minus 64 **x** day	= + ·01 **(A)**	+ ·09 **(A)**	+ ·09 **(A)**
			+ 10·18
Sun's yoga equation **(E)** for 99·20 d. + 34 [☾'s eqn.] d. = + ·04 d. **k** ...	June 20·63 **(B)**	35·50 **(C)**	+ ·04 **(k)**
Moon's yoga equation for 19·32 days **(D)** is + 34 d. = + 34 d. **g**.			☾'s Yoga equation.
Sum of sun's and moon's yoga equations = **k** + **g** = + ·38 **(F)**	+ ·38 **(F)**		19·32 **(D)**

Ending moment of yoga No. 24 Śukla [**(B)** + **(F)**] = June 21·01 = 13 ghaṭikas **(r)** after mean sunrise on Thursday (5) 21 June,

EYE-TABLE FOR BRAHMA SIDDHĀNTA

NOTE.—The different sections of this Table are lettered in order from a to y and All the figures, except where otherwise indicated, represent days and fractions of a day.

a Order of signs of sodiac or rāśis and ☉'s Long. at commencement.	1 ... 0°	2 ... 30°	3 ... 60°	4 ... 90°
Bengal solar month	Vaiśākha	Jyeshṭha	Āshāḍha	Śrāvaṇa
Tamil and Malayālam solar months; also names of rāśis	Mēsha	Vṛishabha	Mithuna	Karkaṭaka
Tamil solar months	Chittirai	Vaigāśi	Āni	Ādi
a Moment of sankrānti in days of solar year, and decimals of a day (Br. Sid.) ...	0·0	30·9316	62·3456	93·9677
" " " (Śid. Śirom.)	0·0	30·9109	62·3111	93·9312
English date corresponding to each sankrānti (A.D. 1900)	Apr. 11	May 12	June 11	July 14
Lunar month: each month commences *before* sankrānti noted in *next* column ...	(1) *Vaiśākha*	(2) *Jyeshṭha*	(3) *Āshāḍha*	(4) *Śrāvaṇa*
b Increase in days, (1) of lunar months, (2) of sun's anomaly		29·5306	59·0612	88·5918
c " of ☾'s An. when interval between Mēsha sank. and 1st N. M. in sol. yr. is 0·00 day.		1·976	3·952	5·928

Tithi equivalents in days and

d Tithi equivalent in days	1	2	3	4	5
	·9843	1·9687	2·9531	3·9374	4·9218
	16	**17**	**18**	**19**	**20**
	15·7496	16·7340	17·7182	18·7027	19·6871

e, f, g Moon's equation of the centre and moon's anomaly in days and

	·00	·01	·02	·03	·04	·05	·06	·07	·08	·09	·10	·11	·12	·13	·14	·15	·16	·17	·18	·19	·20
−	0·00	0·12	0·24	0·35	0·46	0·58	0·70	0·82	0·94	1·06	1·17	1·29	1·42	1·53	1·66	1·79	1·92	2·04	2·16	2·29	2·41
−	13·78	13·68	13·58	13·49	13·39	13·29	13·20	13·10	13·00	12·90	12·80	12·70	12·60	12·50	12·40	12·29	12·19	12·08	11·98	11·87	11·76
+	13·78	13·87	13·97	14·07	14·16	14·26	14·36	14·45	14·55	14·65	14·75	14·85	14·95	15·05	15·16	15·26	15·37	15·47	15·58	15·69	15·79
+	27·55	27·44	27·32	27·20	27·09	26·97	26·85	26·74	26·62	26·50	26·38	26·26	26·14	26·02	25·89	25·77	25·64	25·52	25·39	25·27	25·14
−	0·00	0·12	0·25	0·37	0·50	0·62	0·75	0·87	1·00	1·13	1·26	1·39	1·52	1·65	1·79	1·92	2·06	2·19	2·33	2·47	2·61
−	13·78	13·67	13·57	13·46	13·36	13·25	13·15	13·04	12·94	12·83	12·72	12·61	12·50	12·38	12·27	12·15	12·04	11·92	11·80	11·68	11·56
+	13·78	13·88	13·98	14·09	14·19	14·30	14·40	14·51	14·62	14·73	14·84	14·95	15·06	15·17	15·29	15·40	15·52	15·63	15·75	15·87	15·99
+	27·55	27·43	27·31	27·18	27·06	26·93	26·81	26·68	26·55	26·42	26·29	26·16	26·03	25·90	25·77	25·63	25·50	25·36	25·22	25·08	24·94
−	0·00	0·13	0·27	0·40	0·53	0·67	0·80	0·94	1·07	1·21	1·35	1·49	1·63	1·78	1·92	2·06	2·21	2·36	2·50	2·66	2·82
−	13·78	13·66	13·55	13·44	13·32	13·21	13·09	12·98	12·86	12·74	12·63	12·51	12·38	12·26	12·14	12·01	11·89	11·76	11·63	11·50	11·36
+	13·78	13·89	14·00	14·12	14·28	14·35	14·46	14·57	14·69	14·81	14·98	15·04	15·17	15·29	15·42	15·54	15·66	15·79	15·92	16·05	16·20
+	27·55	27·42	27·29	27·15	27·02	26·89	26·75	26·62	26·48	26·34	26·20	26·07	25·92	25·78	25·64	25·49	25·35	25·20	25·05	24·90	24·74

h For Tithis. Sun's equation of the centre and sun's anomaly in days of the solar

+·178	+·175	+·17	+·16	+·15	+·14	+·13	+·12	+·11	+·10	+·09	+·08	+·07	+·06	+·05	+·04	+·03	+·02	+·01	+·00
359	1·16	8	16	23	29	84	38	42	47	50	54	58	61	65	68	71	75	78	81·23
851	344	337	328	322	316	311	307	302	298	294	291	287	284	280	277	274	270	267	263·86

i For yogas.—Sun's equation

	−·154	−·153	−·15	−·14	−·13	−·12	−·11	−·10	−·09	−·08	−·07	−·06	−·05	−·04	−·03
" Anomaly	355·2	361	3	15	23	29	35	40	45	49	54	58	62	66	70
in days of solar year	355·32	350	343	331	323	316	310	305	300	296	291	287	283	279	275

j Perpetual almanac for European calendar.

[*N.B.*—Heavy type means week-day, Sunday being **1**, Monday **2**, etc.]

	1	2	3	4	5	6	7 or 0
Centuries B.C.	3001	3101	3201				
	2301	2401	2501	2601	2701	2801	2901
	1601	1701	1801	1901	2001	2101	2201
	901	1001	1101	1201	1301	1401	1501
	201	301	401	501	601	701	801
						1	101
Centuries A.D. old style.	500	400	300	200	100	0	
	1200	1100	1000	900	800	700	600
			1700	1600	1500	1400	1300
Centuries A.D. new style.	(1600)	1900		1800		1700	
	2000	2300		2200		2300	

N.B.—B.C. years should be made positive thus: 44 B.C. is 57th year of century beginning with 101 B.C.—see page 14 of the Text.

N.B.—Old Style ceased in continental countries (exc. Russia) on 4-10-1582 and New Style began on 15-10-1582, 10 days being dropped. In United Kingdom, New Style began on 14-9-1752, 11 days being dropped.

Odd years in a Century.	1	2	3	4	5	6	7 or 0	1	2	3	4	5	6	7 or 0
	1	2	3	...	4	5	6	...	52	53	54	55	...	56
	7	...	8	9	10	11	...	57	58	59	...	60	61	62
	12	13	14	15	...	16	17	63	...	64	65	66	67	...
	18	19	...	20	21	22	23	68	69	70	71	...	72	73
	...	24	25	26	27	...	28	74	75	...	76	77	78	79
	29	30	31	...	32	33	34	...	80	81	82	83	...	84
	35	...	36	37	38	39	...	85	86	87	...	88	89	90
	40	41	42	43	...	44	45	91	...	92	93	94	95	...
	46	47	...	48	49	50	51	96	97	98	99	...	...	...

Months in	1	2	3	4	5	6	7 or 0
Ordinary years.	Aug.	Feb. Mar. Nov.	June	Sep. Dec.	Apr. July	Jan. Oct.	May
Leap years ...	Feb.	...	...	...	Jan.	...	...

[*Example.—To find week-day of 26th Jan. 1844—*
Add 4 + 6 + 5 + 26 and divide the total 41 by 7. Remainder, 6 = Friday.]

Centuries.

Kaliyuga.	Commencement of solar year, month and date.	k Fraction of day.	l First new moon in solar year.	m ☾'s anomaly at commencement of solar year.
Brahma Siddhānta.				
B.C.				
0 3102	Feb. 15	·82708	2·17292	1·9988
1 3101	Feb. 16	·08552	20·81204	9·0481
A.D.				
3501 400	Mar. 16	·61677	24·70841	20·4106
3601 500	Mar. 17	·46052	28·19466	8·9262
3701 600	Mar. 18	·30427	2·15032	24·9963
3801 700	Mar. 19	·14802	5·63657	13·5118
3901 800	Mar. 19	·99177	9·12282	2·0274
4001 900	Mar. 20	·83552	12·60907	18·0975
4101 1000	Mar. 21	·67927	16·09532	6·6130
4201 1100	Mar. 22	·52302	19·58156	22·6831
4301 1200	Mar. 23	·36677	23·06781	11·1987
4401 1300	Mar. 24	·21052	26·55406	27·2688
4501 1400	Mar. 25	·05427	0·50973	15·7843
4601 1500	Mar. 25	·89802	3·99598	4·2999
4701 1600	Mar. 26	·74177	7·48223	20·3700
4801 1700	Mar. 27	·58552	10·96848	8·8855
4901 1800	Apr. 9	·42927	14·45473	24·9552
5001 1900	Apr. 11	·27302	17·94098	13·4712
Siddhānta Śiromaṇi.				
B.C.				
0 3102	Feb. 15	·82803	2·17197	1·9979
1 3101	Feb. 16	·00095	20·81110	9·0471
A.D.				
3501 400	Mar. 16	·61120	24·76179	20·3380
4001 900	Mar. 20	·82908	12·67021	18·0144
4101 1000	Mar. 21	·67265	16·15800	6·5278
4201 1100	Mar. 22	·51621	19·64580	22·6998
4301 1200	Mar. 23	·35978	23·13360	11·1156
4401 1300	Mar. 24	·20335	26·62139	27·1773
4501 1400	Mar. 25	·04691	0·57862	15·6907
4601 1500	Mar. 25	·89048	4·06641	4·2042
4701 1600	Mar. 26	·73404	7·55422	20·2721
4801 1700	Mar. 27	·57761	11·04203	8·7856
4901 1800	Apr. 9	·42117	14·52982	24·8533
5001 1900	Apr. 11	·26474	18·01762	13·3671

AND SIDDHĀNTA ŚIROMAṆI.

the way in which they are to be used is shown in the specimen problems attached.
The Table is the same for Brahma Siddhānta and Siddhānta Śiromaṇi, except under a, k, l, m, o, p

5 ..120°	6...150°	7...180°	8...210°	9...240°	10...270°	11...300°	12...330°	
Bhādrapada	Āśvina	Kārttika	Mārgaśirsha	Pausha	Māgha	Phālguna	Chaitra	
Siṁha	Kanyā	Tulā	Vṛiśchika	Dhanus	Makara	Kumbha	Mīna	——
Āvaṇi	Puraṭṭāśi	Aippaśi	Kārttigai	Mārgaḷi	Tai	Māsi	Paṅguni	
125·4471	156·4872	186·9415	216·8368	246·2983	275·6719	305·1177	334·9283	365·2584
125·4213	156·4805	186·9562	216·8699	246·3774	275·7160	305·1533	334·9385	365·2584
Aug. 15	Sep. 15	Oct. 15	Nov. 14	Dec. 14	Jan. 12	Feb. 10	March 12	
(5) *Bhādrapada*	(6) *Āśvina*	(7) *Kārttika*	(8) *Mārgaśīrsha*	(9) *Pausha*	(10) *Māgha*	(11) *Phālguna*	(12) *Chaitra*	(13) *Chaitra when there is an adhika month.*
118·1223	147·6530	177·1835	206·7141	236·2447	265·7753	295·3059	324·8365	354·3670
7·904	9·880	11·856	13·832	15·803	17·784	19·760	21·736	23·712

decimals of a day, and moon's anomalistic months.

6	7	8	9	10	11	12	13	14	15
5·9061	6·8905	7·8748	8·8592	9·8435	10·8379	11·8122	12·7966	13·7809	14·7653
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
20·6714	21·6558	22·6401	23·6245	24·6988	25·5932	26·5775	27·5619	28·5462	29·5306

Moon's anomalistic months.

1 month = 27·5545 days.
2 months = 55·1090 days.
12 months = 330·6540.
13 months = 358·2085.

decimals of a day. (* The signs − and + are to be applied to the equation in heavy type and not to the anomaly.)

·21	·22	·23	·24	·25	·26	·27	·28	·29	·30	·31	·32	·33	·34	·35	·36	·37	·38	·39	·40	·41	
2·55	2·68	2·82	2·96	3·10	3·25	3·40	3·55	3·71	3·87	4·04	4·22	4·41	4·60	4·79	5·00	5·25	5·52	5·84	6·23	6·79	
11·65	11·53	11·41	11·29	11·17	11·05	10·92	10·79	10·65	10·51	10·36	10·20	10·03	9·86	9·68	9·49	9·28	9·02	8·74	8·39	7·83	e For tithis.
25·01	24·87	24·73	24·59	24·45	24·30	24·15	24·00	23·85	23·68	23·51	23·33	23·15	22·96	22·76	22·55	22·32	22·03	21·74	21·36	20·79	
2·76	2·91	3·06	3·22	3·38	3·54	3·71	3·89	4·07	4·27	4·48	4·69	4·90	5·15	5·46	5·79	6·16	6·82				
11·43	11·30	11·17	11·04	10·90	10·76	10·61	10·45	10·28	10·11	9·92	9·73	9·53	9·31	9·01	8·71	8·36	7·72				f For nakshatras.
24·79	24·64	24·49	24·33	24·17	24·01	23·84	23·67	23·48	23·29	23·08	22·87	22·65	22·41	22·09	21·76	21·39	20·78				
2·98	3·14	3·31	3·49	3·67	3·86	4·05	4·26	4·49	4·72	4·97	5·24	5·58	5·95	6·49							
11·21	11·07	10·92	10·77	10·61	10·44	10·26	10·07	9·87	9·65	9·42	9·18	8·86	8·50	7·99							
16·34	16·48	16·63	16·79	16·95	17·11	17·29	17·48	17·68	17·90	18·13	18·38	18·69	19·05	19·57							g For yogas.
24·57	24·41	24·24	24·06	23·88	23·70	23·50	23·29	23·07	22·83	22·58	22·31	21·98	21·60	21·06							

year and decimals of a day. (The anomalies are entered in ordinary type and the equations, with appropriate signs, in heavy type.)

−·01	−·02	−·03	−·04	−·05	−·06	−·07	−·08	−·09	−·10	−·11	−·12	−·13	−·14	−·15	−·16	−·17	−·175	−·178
85	88	91	94	98	101	105	108	112	116	120	124	129	134	139	146	155	161	169
261	257	254	251	247	244	240	237	233	229	225	221	216	211	206	199	191	184	176

−·02	−·01	−·00	+·01	+·02	+·03	+·04	+·05	+·06	+·07	+·08	+·09	+·10	+·11	+·12	+·13	+·14	+·15	+·153	+·154
74	77	81·23	85	89	93	96	100	104	109	113	118	122	128	133	140	148	160	167	173·4
271	268	263·86	260	256	252	248	244	240	236	232	227	222	217	212	205	197	185	178	173·4

Odd years.

	Fraction of day, marking commencement of solar year.	First new moon in solar year.	☾'s anomaly at beginning of solar year.
	n	**o**	**p**
1	·25844	18·63913	7·0493
2	·51687	7·74768	14·0987
3	·77631	26·38681	21·1480
4	·03375	15·49535	0·6428
5	·29219	4·60390	7·6921
6	·55062	23·24303	14·7415
7	·80906	12·35158	21·7908
8	·06750	1·46012	1·2856
9	·32594	20·09925	8·3349
10	·58438	9·20780	15·3843
11	·84281	27·84693	22·4336
12	·10125	16·95548	1·9284
13	·35969	6·06402	8·9778
14	·61813	24·70315	16·0271
15	·87656	13·81170	23·0764
16	·13500	2·92025	2·5712
17	·39344	21·55937	9·6206
18	·65188	16·66792	16·6699
19	·94031	29·30705	23·7192
20	·16875	18·41560	3·2140
21	·42719	7·52415	10·2634
22	·68503	26·16327	17·3127
23	·94406	15·27182	24·3620
24	·20250	4·39037	3·8568
25	·46094	23·01950	19·9062
26	·71938	12·12804	17·9555
27	·97781	0·12366	25·0048
28	·23625	19·87572	4·4996
29	·49469	8·98427	11·5490
30	·75313	27·62340	18·5983
31	1·01156	16·73194	25·6476
32	·27000	5·84049	5·1424
33	·52844	24·47962	12·1918
34	·78688	13·58817	19·2411
35	1·04531	2·69672	26·2904
36	·30375	21·33584	5·7852
37	·56219	10·44440	12·8346
38	·82063	29·08352	19·8839
39	1·07906	18·19201	26·9332
40	·33750	7·30061	6·4280
41	·59594	25·93974	13·4773
42	·85438	15·04829	20·5267
43	1·11281	4·15684	27·5760
44	·37125	22·79596	7·0708
45	·62969	11·90451	14·1202
46	·88813	1·01306	21·1695
47	1·14656	19·65219	28·2189
48	·40500	8·76074	7·7136
49	·66344	27·39987	14·7630
50	·92188	16·50841	21·8123
51	1·18031	5·61696	1·3071
52	·43875	24·25608	8·3565
53	·69719	13·36464	15·4008
54	·95563	2·47318	22·4551
55	1·21406	21·11231	1·9499
56	·47250	10·22086	8·9993
57	·73094	28·85999	16·0486
58	·98938	17·96854	23·0979
59	1·24781	7·07708	2·5927
60	·50625	25·71621	9·6421
61	·76469	14·82476	16·6914
62	1·02313	3·93331	23·7407
63	1·28156	22·57244	3·2355
64	·54000	11·68098	10·2850
65	·79844	0·78953	17·3342
66	·05688	19·42866	24·3835
67	1·31531	8·53721	3·8783
68	·57375	27·17634	10·9276
69	·83219	16·28488	7·9770
70	1·09063	5·39343	25·0263
71	1·34906	24·03256	4·5211
72	·60750	13·14111	11·5705
73	·86594	2·24965	8·6198
74	1·12438	20·88878	25·6691
75	1·38281	9·99733	5·1639
76	·64125	28·63646	12·2188
77	·89969	17·74501	19·2626
78	1·15813	6·85355	26·3119
79	1·41656	25·49268	5·8067
80	·67500	14·60123	12·8561
81	·93344	3·70978	19·9054
82	·19188	22·34890	26·9548
83	·45031	11·45745	6·4495
84	·70875	0·56601	13·4989
85	·96719	19·20518	20·5482
86	1·22563	8·31368	·0430
87	1·48406	26·95281	7·0923
88	·74250	16·06135	14·1417
89	1·00094	5·16990	21·1910
90	1·25937	23·80903	·6858
91	1·51781	12·91758	7·7351
92	·77625	2·02613	14·7845
93	1·03469	20·66525	21·8338
94	1·29313	9·77380	1·3286
95	1·55156	28·41293	8·3780
96	·81000	17·52148	15·4273
97	1·06844	6·63002	22·4766
98	1·32688	25·26915	1·971◆
99	1·58531	14·37770	9·0208
100	·25844	3·48625	16·0701

For Siddhānta Śiromaṇi, **odd years, n** is the same as for Brahma Siddhānta. **o** is very slightly more, the increase being + ·000014 for every year, total increase of **o** for 100 yrs. = ·00137. Similarly **p** for Siddhānta Śiromaṇi odd years decreases by ·00002 for every year; total decrease of **p** for 100 yrs. = ·002.

q Days counted from March 1

	Mar. 1	Apr. 1	May 1	June 1	July 1	Aug. 1	Sep. 1	Oct. 1	Nov. 1	Dec. 1	Jan. 1	Feb. 1	Mar. 1
March ...	1	32	62	93	123	154	185	215	246	276	307	338	...

r															
Ghaṭikas ...	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Fraction of day.	·0167	·0333	·0500	·0667	·0833	·1000	·1167	·1333	·1500	·1667	·1833	·2000	·2167	·2333
Ghaṭikas ...	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**
Fraction of day.	·5167	·5333	·5500	·5667	·5833	·6000	·6167	·6333	·6500	·6667	·6833	·7000	·7167	·7333
Palas ...	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**12**	**15**	**17**	**20**
Fraction of day.	·0003	·0005	·0008	·0011	·0014	·0017	·0019	·0022	·0025	·0028	·0033	·0042	·0047	·0055

NAKSHA

s Shortest interval in days, from new moon to ending

Longitude at commencement.			Order	Names of nakshatras.	Days.	Order	Ordinarily Vaiśākha	Order	Ordinarily Jyeshṭha	Order	Ordinarily Āshāḍha	Order	Ordinarily Śrāvaṇa	Order	Ordinarily Bhādrapada	Order	Ordinarily Āśvina	Order	Ordinarily Kārttika
Deg.	Min.	Sec.					I		II		III		IV		V		VI		VII
			27	Revati		**3**	0·4536	**5**	0·7446	**7**	0·5357	**10**	0·8267	**12**	1·277	**14**	0·4089	**16**	0·7000
0	0	0	**1**	Aśvini	1	**4**	1·9536	**6**	1·2446	**8**	1·5357	**11**	1·8267	**13**	2·277	**15**	1·4089	**17**	1·7000
13	10	35	**2**	Bharaṇi	1·5	**5**	2·9536	**7**	2·7446	**9**	2·0357	**12**	3·3267	**14**	2·6177	**16**	2·9089	**18**	2·2000
19	45	52	**3**	Kṛittikā	2·5	**6**	3·4536	**8**	3·7446	**10**	3·0357	**13**	4·3267	**15**	3·6177	**17**	3·9089	**19**	3·2000
32	56	27	**4**	Rohiṇi	4	**7**	4·9536	**9**	4·2446	**11**	4·0357	**14**	4·8267	**16**	5·1177	**18**	4·4089	**20**	4·2000
52	42	20	**5**	Mṛigaśira	5	**8**	5·9536	**10**	5·2446	**12**	5·5357	**15**	5·8267	**17**	6·1177	**19**	5·4089	**21**	5·7000
65	52	55	**6**	Ardrā	5·5	**9**	6·4536	**11**	6·2446	**13**	6·5357	**16**	7·3267	**18**	6·6177	**20**	6·4089	**A**	6·0216
72	28	12	**7**	Punarvasu	7	**10**	7·4536	**12**	7·7446	**14**	7·0357	**17**	8·3267	**19**	7·6177	**21**	7·9089	**22**	7·0216
92	14	5	**8**	Pushya	8	**11**	8·4536	**13**	8·7446	**15**	8·0357	**18**	8·8267	**20**	8·6177	**A**	8·2305	**23**	8·0216
105	24	40	**9**	Aśleshā	8·5	**12**	9·9536	**14**	9·2446	**16**	9·5357	**19**	9·8267	**21**	10·1177	**22**	9·2305	**24**	8·5216
111	59	57	**10**	Maghā	9·5	**13**	10·9536	**15**	10·2447	**17**	10·5357	**20**	10·8267	**A**	10·4393	**23**	10·2305	**25**	9·0216
125	10	32	**11**	Pūrva-Phalgunī ...	10·5	**14**	11·4536	**16**	11·7447	**18**	11·0357	**21**	12·3267	**22**	11·4393	**24**	10·7305	**26**	11·0216
138	21	7	**12**	Uttara-Phalgunī ...	12	**15**	12·4536	**17**	12·7447	**19**	12·0357	**A**	12·6483	**23**	12·4394	**25**	11·7305	**27**	12·0216
158	7	0	**13**	Hasta	13	**16**	13·9536	**18**	13·2447	**20**	13·0357	**22**	13·6483	**24**	12·9394	**26**	13·2305	**1**	13·0216
171	17	35	**14**	Chitrā	13·5	**17**	14·9536	**19**	14·2447	**21**	14·5357	**23**	14·6483	**25**	13·9394	**27**	14·2305	**2**	13·5216
178	28	10	**15**	Svāti	14·5	**18**	15·4536	**20**	15·2447	**A**	14·8573	**24**	15·1483	**26**	15·4394	**1**	15·2305	**3**	14·5216
191	3	27	**16**	Viśākhā	16	**19**	16·4536	**21**	16·7447	**22**	15·8573	**25**	16·1483	**27**	16·4394	**2**	15·7305	**4**	16·0216
210	49	20	**17**	Anurādhā	17	**20**	17·4536	**A**	17·0663	**23**	16·8573	**26**	17·6483	**1**	17·4394	**3**	16·7305	**5**	17·0216
223	59	55	**18**	Jyeshṭhā	17·5	**21**	18·9536	**22**	18·0663	**24**	17·3573	**27**	18·8483	**2**	17·9394	**4**	18·2305	**6**	17·5216
230	35	12	**19**	Mūla	18·5	**A**	19·2752	**23**	19·0663	**25**	18·3573	**1**	19·6483	**3**	18·9394	**5**	19·2305	**7**	19·0216
243	45	47	**20**	Purva-Āshāḍhā ...	19·5	**22**	20·2752	**24**	19·5663	**26**	19·8573	**2**	20·1483	**4**	20·4394	**6**	19·7305	**8**	20·0216
256	56	22	**21**	Uttara-Āshāḍhā ...	21	**23**	21·2752	**25**	20·5663	**27**	20·8573	**3**	21·1483	**5**	21·4394	**7**	21·2305	**9**	20·5216
276	42	15	**A**	Abhijit	21·3216	**24**	21·7752	**26**	22·0663	**1**	21·8573	**4**	22·6483	**6**	21·9394	**8**	22·2305	**10**	21·5216
280	56	30	**22**	Śravana	22·32	**25**	22·7752	**27**	23·0663	**2**	22·8573	**5**	23·6483	**7**	23·4394	**9**	22·7305	**11**	22·5216
294	7	5	**23**	Dhanishta	23·32	**26**	24·2752	**1**	24·0663	**3**	23·3573	**6**	24·1483	**8**	24·4394	**10**	23·7305	**12**	24·0216
307	17	40	**24**	Satabhishaj	24·82	**27**	25·2752	**2**	24·5663	**4**	24·8573	**7**	25·6483	**9**	24·9394	**11**	24·7305	**13**	25·0216
313	52	57	**25**	Pūrva-Bhādrapadā ...	25·32	**1**	26·2752	**3**	25·5663	**5**	25·8573	**8**	26·6483	**10**	25·9394	**12**	26·2305	**14**	25·5216
327	3	32	**26**	Uttara-Bhādrapadā ...	26·32	**2**	26·7752	**4**	27·0663	**6**	26·3573	**9**	27·1483	**11**	26·9394	**13**	27·2305	**15**	26·5216
346	49	25	**27**	Revati	27·32	**3**	27·7752	**5**	28·0663	**7**	27·8573	**10**	28·1483	**12**	28·4394	**14**	27·7305	**16**	28·0216
						4	29·2752	**6**	28·5663	**8**	28·8573	**11**	29·2483	**13**	29·4394	**15**	28·7305	**17**	29·0216
										9	29·3573							**18**	29·5216

YOGAS.

v Shortest interval in days from new moon to

Longitude at commencement.		Order	Names of yogas.	Order	Ordinarily Vaiśākha	Order	Ordinarily Jyeshṭha	Order	Ordinarily Āshāḍha	Order	Ordinarily Śrāvaṇa	Order	Ordinarily Bhādrapada	Order	Ordinarily Āśvina	Order	Ordinarily Kārttika
Deg.	Min.																
346	40	**27**	Vaidhriti	**5**	0·8995	**9**	0·5551	**13**	0·2107	**18**	0·8078	**22**	0·4634	**26**	0·1190	**4**	0·7160
0	0	**1**	Vishkamba	**6**	1·8410	**10**	1·4966	**14**	1·1522	**19**	1·7493	**23**	1·4049	**27**	1·0604	**5**	1·6575
13	20	**2**	Priti	**7**	2·7825	**11**	2·4381	**15**	2·0937	**20**	2·6908	**24**	2·3463	**1**	2·0019	**6**	2·5990
26	40	**3**	Ayushmat	**8**	3·7240	**12**	3·3796	**16**	3·0352	**21**	3·6312	**25**	3·2878	**2**	2·9434	**7**	3·5405
40	0	**4**	Saubhagya	**9**	4·6655	**13**	4·3211	**17**	3·9766	**22**	4·5737	**26**	4·2293	**3**	3·8849	**8**	4·4820
53	20	**5**	Sobhana	**10**	5·6070	**14**	5·2625	**18**	4·9181	**23**	5·5152	**27**	5·1708	**4**	4·8264	**9**	5·4235
66	40	**6**	Atiganda	**11**	6·5485	**15**	6·2040	**19**	5·8596	**24**	6·4567	**1**	6·1123	**5**	5·7679	**10**	6·3650
80	0	**7**	Sukarman	**12**	7·4889	**16**	7·1455	**20**	6·8011	**25**	7·3982	**2**	7·0538	**6**	6·7094	**11**	7·3065
93	20	**8**	Dhriti	**13**	8·4314	**17**	8·0870	**21**	7·7426	**26**	8·3397	**3**	7·9953	**7**	7·6509	**12**	8·2480
106	40	**9**	Śula	**14**	9·3729	**18**	9·0285	**22**	8·6841	**27**	9·2812	**4**	8·9368	**8**	8·5924	**13**	9·1894
120	0	**10**	Ganda	**15**	10·3144	**19**	9·9700	**23**	9·6256	**1**	10·2227	**5**	9·8783	**9**	9·5338	**14**	10·1309
133	20	**11**	Vriddhi	**16**	11·2559	**20**	10·9115	**24**	10·5671	**2**	11·1642	**6**	10·8198	**10**	10·4753	**15**	11·0724
146	40	**12**	Dhruva	**17**	12·1974	**21**	11·8530	**25**	11·5086	**3**	12·1056	**7**	11·7612	**11**	11·4168	**16**	12·0139
160	0	**13**	Vyaghata	**18**	13·1389	**22**	12·7945	**26**	12·4501	**4**	13·0471	**8**	12·7027	**12**	12·3583	**17**	12·9554
173	20	**14**	Harshana	**19**	14·0804	**23**	13·7360	**27**	13·3915	**5**	13·9886	**9**	13·6442	**13**	13·2998	**18**	13·8969
186	40	**15**	Vajra	**20**	15·0219	**24**	14·6774	**1**	14·3330	**6**	14·9301	**10**	14·5857	**14**	14·2413	**19**	14·8384
200	0	**16**	Siddhi	**21**	15·9633	**25**	15·6189	**2**	15·2745	**7**	15·8716	**11**	15·5272	**15**	15·1828	**20**	15·7799
213	20	**17**	Vyatipata	**22**	16·9048	**26**	16·5604	**3**	16·2160	**8**	16·8131	**12**	16·4687	**16**	16·1243	**21**	16·7214
226	40	**18**	Variyas	**23**	17·8463	**27**	17·5019	**4**	17·1575	**9**	17·7546	**13**	17·4102	**17**	17·0658	**22**	17·6628
240	0	**19**	Parigha	**24**	18·7878	**1**	18·4434	**5**	18·0990	**10**	18·6961	**14**	18·3517	**18**	18·0073	**23**	18·6043
253	20	**20**	Siva	**25**	19·7293	**2**	19·3849	**6**	19·0405	**11**	19·6376	**15**	19·2932	**19**	18·9487	**24**	19·5458
266	40	**21**	Siddha	**26**	20·6708	**3**	20·3264	**7**	19·9820	**12**	20·5791	**16**	20·2346	**20**	19·3902	**25**	20·4873
280	0	**22**	Sadhya	**27**	21·6123	**4**	21·2679	**8**	20·9235	**13**	21·5205	**17**	21·1761	**21**	20·8317	**26**	21·4288
293	20	**23**	Śubha	**1**	22·5538	**5**	22·2094	**9**	21·8650	**14**	22·4620	**18**	22·1176	**22**	21·7732	**27**	22·3703
306	40	**24**	Śukla	**2**	23·4953	**6**	23·1509	**10**	22·8064	**15**	23·4035	**19**	23·0591	**23**	22·7147	**1**	23·3118
320	0	**25**	Brahmaṇa	**3**	24·4368	**7**	24·0923	**11**	23·7479	**16**	24·3450	**20**	24·0006	**24**	23·6562	**2**	24·2533
333	20	**26**	Indra	**4**	25·3782	**8**	25·0338	**12**	24·6894	**17**	25·2865	**21**	24·9421	**25**	24·5977	**3**	25·1948
346	40	**27**	Vaidhriti	**5**	26·3197	**9**	25·9753	**13**	25·6309	**18**	26·2280	**22**	25·8836	**26**	25·5392	**4**	26·1363
				6	27·2619	**10**	26·9168	**14**	26·5724	**19**	27·1695	**23**	26·8251	**27**	26·4805	**5**	27·0777
				7	28·2027	**11**	27·8583	**15**	27·5139	**20**	28·1110	**24**	27·7666	**1**	27·4222	**6**	28·0192
				8	29·1442	**12**	28·7998	**16**	28·4554	**21**	29·0525	**25**	28·7081	**2**	28·3636	**7**	28·9607
								17	29·3969					**3**	29·3051		

q Days counted from April 1

April ...	Apr. 1	May 1	June 1	July 1	Aug. 1	Sep. 1	Oct. 1	Nov. 1	Dec. 1	Jan. 1	Feb. 1	Mar. 1
	1	31	62	92	123	154	184	215	245	276	307	335
												Leap Year, Ap. 336

15 2500	**16** ·2667	**17** ·2833	**18** ·3000	**19** ·3167	**20** ·3333	**21** ·3500	**22** ·3667	**23** ·3833	**24** ·4000	**25** ·4167	**26** ·4333	**27** ·4500	**28** ·4667	**29** ·4833	**30** ·5000
45 ·7500	**46** ·7667	**47** ·7833	**48** ·8000	**49** ·8167	**50** ·8333	**51** ·8500	**52** ·8667	**53** ·8833	**54** ·9000	**55** ·9167	**56** ·9333	**57** ·9500	**58** ·9667	**59** ·9833	**60** 1·0000
22 ·0061	**25** ·0069	**27** ·0075	**30** ·0083	**32** ·0089	**35** ·0097	**37** ·0103	**40** ·0111	**42** ·0117	**45** ·0125	**47** ·0130	**50** ·0139	**52** ·0144	**55** ·0153	**57** ·0158	**60** ·0167

TRAS.

moment of each nakshatra.

Order	Ordinarily Mārgasirsha	Order	Ordinarily Pausha	Order	Ordinarily Māgha	Order	Ordinarily Phālguna	Order	Chaitra when no Adhika Masa	Order	Chaitra when there is Adhika Masa
	VIII		IX		X		XI		XII		XIII
19	0·9910	**21**	1·2821	**22**	0·3948	**25**	0·6869	**27**	0·9770	**2**	0·2681
20	1·9910	**A**	1·6037	**23**	1·3948	**26**	2·1859	**1**	1·9770	**3**	1·2681
21	3·4910	**22**	2·6037	**24**	1·8948	**27**	3·1859	**2**	2·4770	**4**	2·7681
A	3·8126	**23**	3·6037	**25**	2·8248	**1**	4·1859	**3**	3·4770	**5**	3·7681
22	4·8126	**24**	4·1037	**26**	4·3948	**2**	4·6859	**4**	4·9770	**6**	4·2681
23	5·8126	**25**	5·1037	**27**	5·3948	**3**	5·6859	**5**	5·9770	**7**	5·7681
24	6·3126	**26**	6·6037	**1**	6·3948	**4**	7·1859	**6**	6·4770	**8**	6·7681
25	7·3126	**27**	7·6037	**2**	6·8948	**5**	8·1859	**7**	7·9770	**9**	7·2681
26	8·8126	**1**	8·6037	**3**	7·8948	**6**	8·6859	**8**	8·9770	**10**	8·2681
27	9·8126	**2**	9·1037	**4**	9·3948	**7**	10·1859	**9**	9·4770	**11**	9·2681
1	10·8126	**3**	10·1037	**5**	10·3948	**8**	11·1859	**10**	10·4770	**12**	10·7621
2	11·8126	**4**	11·6037	**6**	10·8948	**9**	11·6859	**11**	11·4770	**13**	11·7681
3	12·3126	**5**	12·6037	**7**	12·3948	**10**	12·6859	**12**	12·9770	**14**	12·2681
4	13·8126	**6**	13·1037	**8**	13·3948	**11**	13·6859	**13**	13·9770	**15**	13·2681
5	14·8126	**7**	14·6037	**9**	14·8948	**12**	15·1859	**14**	14·4770	**16**	14·7681
6	15·3126	**8**	15·6037	**10**	14·8948	**13**	16·1859	**15**	15·4770	**17**	15·7681
7	16·8126	**9**	16·1037	**11**	15·8948	**14**	16·6859	**16**	16·9770	**18**	16·2681
8	17·8126	**10**	17·1037	**12**	17·3948	**15**	17·6859	**17**	17·9770	**19**	17·2681
9	18·3126	**11**	18·1037	**13**	18·3948	**16**	19·1859	**18**	18·4770	**20**	18·2681
10	19·3126	**12**	19·6037	**14**	18·8948	**17**	20·1859	**19**	19·4770	**21**	19·7681
11	20·3126	**13**	20·6037	**15**	19·8948	**18**	20·6859	**20**	20·4770	**A**	20·0897
12	21·8126	**14**	21·1037	**16**	21·3948	**19**	21·6859	**21**	21·9770	**22**	21·0897
13	22·8126	**15**	22·1037	**17**	22·3948	**20**	22·6859	**A**	22·2986	**23**	22·0897
14	23·3126	**16**	23·6037	**18**	22·8948	**21**	24·1859	**22**	23·2986	**24**	22·5897
15	24·8126	**17**	24·6037	**19**	23·8948	**A**	24·5075	**23**	24·2986	**25**	23·5897
16	25·8126	**18**	25·1037	**20**	24·8948	**22**	25·5075	**24**	24·7986	**26**	25·0897
17	26·8126	**19**	26·1037	**21**	26·3948	**23**	26·5075	**25**	25·7986	**27**	26·0897
18	27·3126	**20**	27·1037	**A**	26·7164	**24**	27·0075	**26**	27·2986	**1**	27·0897
19	28·3126	**21**	28·6037	**22**	27·7164	**25**	28·0075	**27**	28·2986	**2**	27·5897
20	29·3126	**A**	28·9253	**23**	28·7164	**26**	29·5075	**1**	29·2986	**3**	28·5897
				24	29·2164						

ending moment of each yoga.

Order	Ordinarily Mārgasirsha	Order	Ordinarily Pausha	Order	Ordinarily Māgha	Order	Ordinarily Phālguna	Order	Chaitra when no Adhika Masa	Order	Chaitra when there is Adhika Masa
8	0·3716	**12**	0·0272	**17**	0·6243	**21**	0·2799	**26**	0·8770	**3**	0·5325
9	1·3131	**13**	0·9687	**18**	1·5658	**22**	1·2214	**27**	1·8185	**4**	1·4740
10	2·2546	**14**	1·9102	**19**	2·5073	**23**	2·1629	**1**	2·7599	**5**	2·4155
11	3·1961	**15**	2·8517	**20**	3·4488	**24**	3·1044	**2**	3·7014	**6**	3·3570
12	4·1376	**16**	3·7930	**21**	4·3903	**25**	4·0458	**3**	4·6429	**7**	4·2985
13	5·0791	**17**	4·7347	**22**	5·3317	**26**	4·9873	**4**	5·5844	**8**	5·2400
14	6·0206	**18**	5·6762	**23**	6·2732	**27**	5·9288	**5**	6·5256	**9**	6·1815
15	6·9621	**19**	6·6176	**24**	7·2147	**1**	6·8703	**6**	7·4674	**10**	7·1230
16	7·9035	**20**	7·5591	**25**	8·1562	**2**	7·8118	**7**	8·4089	**11**	8·0645
17	8·8450	**21**	8·5006	**26**	9·0977	**3**	8·7533	**8**	9·3504	**12**	9·0060
18	9·7865	**22**	9·4121	**27**	10·0392	**4**	9·6948	**9**	10·2919	**13**	9·9475
19	10·7280	**23**	10·3836	**1**	10·9807	**5**	10·6363	**10**	11·2334	**14**	10·8889
20	11·6695	**24**	11·3251	**2**	11·9222	**6**	11·5778	**11**	12·1748	**15**	11·8304
21	12·6110	**25**	12·2666	**3**	12·8637	**7**	12·5193	**12**	13·1163	**16**	12·7719
22	13·5525	**26**	13·2081	**4**	13·8051	**8**	13·4607	**13**	14·0578	**17**	13·7134
23	14·4940	**27**	14·1496	**5**	14·7466	**9**	14·4022	**14**	14·9993	**18**	14·6549
24	15·4355	**1**	15·0910	**6**	15·6881	**10**	15·3437	**15**	15·9408	**19**	15·5964
25	16·3769	**2**	16·0325	**7**	16·6296	**11**	16·2852	**16**	16·8823	**20**	16·5379
26	17·3184	**3**	16·9740	**8**	17·5711	**12**	17·2267	**17**	17·8238	**21**	17·4794
27	18·2599	**4**	17·9155	**9**	18·5126	**13**	18·1682	**18**	18·7653	**22**	18·4209
1	19·2014	**5**	18·8570	**10**	19·4541	**14**	19·1097	**19**	19·7068	**23**	19·3624
2	20·1429	**6**	19·7985	**11**	20·3956	**15**	20·0512	**20**	20·6487	**24**	20·3038
3	21·0844	**7**	20·7310	**12**	21·3371	**16**	20·9927	**21**	21·5897	**25**	21·2453
4	22·0259	**8**	21·6815	**13**	22·2786	**17**	21·9341	**22**	22·5310	**26**	22·1868
5	22·9674	**9**	22·6230	**14**	23·2200	**18**	22·8756	**23**	23·4727	**27**	23·1283
6	23·9088	**10**	23·5645	**15**	24·1615	**19**	23·8171	**24**	24·4137	**1**	24·0698
7	24·8504	**11**	24·5059	**16**	25·1030	**20**	24·7586	**25**	25·3557	**2**	25·0113
8	25·7918	**12**	25·4474	**17**	26·0445	**21**	25·7001	**26**	26·2972	**3**	25·9528
9	26·7333	**13**	26·3889	**18**	26·9860	**22**	26·6417	**27**	27·2387	**4**	26·8943
10	27·6748	**14**	27·3304	**19**	27·9275	**23**	27·5831	**1**	28·1802	**5**	27·8358
11	28·6163	**15**	28·2719	**20**	28·8690	**24**	28·5247	**2**	29·1217	**6**	28·7772
		16	29·2134			**25**	29·4861				

Annual correction.

Argument:—Date of appearance of 1st new moon in each solar year.

The correction **u** or **x** corresponding to the decimal portion of the argument should be *subtracted* from the nakshatra or yoga correction corresponding to the integral portion **t** or **u**.

Ex.: the nakshatra correction corresponding to an argument 28·53 = 0·11 *minus* ·04 = 0·07. The yoga correction for the same argument is 0·21 *minus* ·07 = 0·14.

The whole correction thus obtained should be *added* to ending moment of nakshatra or yoga in Eye-table (s) or (v).

NAKSHATRAS.

Arg.	Corrn. t	Arg.	Corrn. t	Arg.	Corrn. t	Arg.	Corrn. t	Arg.	Corrn. t
0	2·20890	**6**	1·76010	**12**	1·31129	**18**	0·86249	**24**	0·41368
1	2·13410	**7**	1·68531	**13**	1·23649	**19**	0·78762	**25**	0·33888
2	2·05930	**8**	1·61049	**14**	1·16169	**20**	0·71288	**26**	0·26408
3	1·98450	**9**	1·53569	**15**	1·08689	**21**	0·63808	**27**	0·18928
4	1·90970	**10**	1·46089	**16**	1·01209	**22**	0·56328	**28**	0·11448
5	1·83490	**11**	1·38609	**17**	0·93729	**23**	0·48848	**29**	0·03968

	u		u		u		u		u
·01	·00075	**·21**	·01571	**·41**	·03067	**·61**	·04565	**·81**	·06059
·02	·00150	**·22**	·01646	**·42**	·03142	**·62**	·04638	**·82**	·06134
·03	·00224	**·23**	·01720	**·43**	·03216	**·63**	·04712	**·83**	·06208
·04	·00299	**·24**	·01795	**·44**	·03291	**·64**	·04787	**·84**	·06283
·05	·00374	**·25**	·01870	**·45**	·03366	**·65**	·04862	**·85**	·06358
·06	·00449	**·26**	·01945	**·46**	·03441	**·66**	·04937	**·86**	·06433
·07	·00524	**·27**	·02020	**·47**	·03516	**·67**	·05012	**·87**	·06508
·08	·00598	**·28**	·02094	**·48**	·03590	**·68**	·05086	**·88**	·06582
·09	·00673	**·29**	·02169	**·49**	·03665	**·69**	·05161	**·89**	·06657
·10	·00748	**·30**	·02244	**·50**	·03740	**·70**	·05236	**·90**	·06732
·11	·00823	**·31**	·02319	**·51**	·03815	**·71**	·05311	**·91**	·06807
·12	·00898	**·32**	·02394	**·52**	·03890	**·72**	·05386	**·92**	·06882
·13	·00972	**·33**	·02468	**·53**	·03964	**·73**	·05460	**·93**	·06956
·14	·01047	**·34**	·02543	**·54**	·04039	**·74**	·05535	**·94**	·07031
·15	·01122	**·35**	·02618	**·55**	·04114	**·75**	·05610	**·95**	·07106
·16	·01197	**·36**	·02693	**·56**	·04189	**·76**	·05685	**·96**	·07181
·17	·01272	**·37**	·02768	**·57**	·04264	**·77**	·05760	**·97**	·07256
·18	·01346	**·38**	·02842	**·58**	·04338	**·78**	·05834	**·98**	·07330
·19	·01421	**·39**	·02917	**·59**	·04413	**·79**	·05909	**·99**	·07405
·20	·01495	**·40**	·02992	**·60**	·04488	**·80**	·05984		

YOGAS.

See note on ANNUAL CORRECTION *supra*.

w		w		w		w		w	
0	4·11036	**6**	3·27522	**12**	2·44008	**18**	1·60494	**24**	0·76980
1	3·97117	**7**	3·13603	**13**	2·30089	**19**	1·46575	**25**	0·63061
2	3·83198	**8**	2·99684	**14**	2·16170	**20**	1·32656	**26**	0·49142
3	3·69279	**9**	2·85765	**15**	2·02251	**21**	1·18737	**27**	0·35223
4	3·55360	**10**	2·71846	**16**	1·88332	**22**	1·04818	**28**	0·21304
5	3·41441	**11**	2·57927	**17**	1·74413	**23**	0·90899	**29**	0·07385

	x		x		x		x		x
·01	·00139	**·21**	·02923	**·41**	·05707	**·61**	·08491	**·81**	·11274
·02	·00278	**·22**	·03063	**·42**	·05846	**·62**	·08630	**·82**	·11413
·03	·00417	**·23**	·03291	**·43**	·05985	**·63**	·08769	**·83**	·11553
·04	·00557	**·24**	·03340	**·44**	·06124	**·64**	·08908	**·84**	·11692
·05	·00696	**·25**	·03480	**·45**	·06263	**·65**	·09047	**·85**	·11831
·06	·00835	**·26**	·03619	**·46**	·06493	**·66**	·09186	**·86**	·11970
·07	·00974	**·27**	·03758	**·47**	·06542	**·67**	·09326	**·87**	·12109
·08	·01113	**·28**	·03897	**·48**	·06681	**·68**	·09465	**·88**	·12249
·09	·01253	**·29**	·04036	**·49**	·06820	**·69**	·09604	**·89**	·12388
·10	·01392	**·30**	·04176	**·50**	·06959	**·70**	·09743	**·90**	·12527
·11	·01530	**·31**	·04315	**·51**	·07098	**·71**	·09882	**·91**	·12666
·12	·01670	**·32**	·04454	**·52**	·07238	**·72**	·10022	**·92**	·12805
·13	·01809	**·33**	·04593	**·53**	·07377	**·73**	·10161	**·93**	·12945
·14	·01949	**·34**	·04732	**·54**	·07516	**·74**	·10300	**·94**	·13084
·15	·02088	**·35**	·04872	**·55**	·07655	**·75**	·10439	**·95**	·13223
·16	·02227	**·36**	·05011	**·56**	·07795	**·76**	·10578	**·96**	·13362
·17	·02366	**·37**	·05150	**·57**	·07934	**·77**	·10798	**·97**	·13601
·18	·02505	**·38**	·05289	**·58**	·08073	**·78**	·10851	**·98**	·13641
·19	·02645	**·39**	·05428	**·59**	·08212	**·79**	·10996	**·99**	·13780
·20	·02784	**·40**	·05568	**·60**	·08351	**·80**	·11135		

y Calendar to be used with Table II, as directed in specimen problems, for ascertaining the A.D. month and day corresponding to any solar date, lunar tithi, nakshatra, yoga or karana.

Day of solar year.	Tithi No.	Ending moment of tithi.	₵'s An. for each tithi.

Vaiśākha.

0	·9843	1	0·984
1	·9687	2	1·969
2	·9530	3	2·953
3	·9374	4	3·937
4	·9217	5	4·921
5	·9061	6	5·906
6	·8904	7	6·890
7	·8748	8	7·875
8	·8592	9	8·859
9	·8435	10	9·843
10	·8279	11	10·827
11	·8122	12	11·812
12	·7966	13	12·797
13	·7809	14	13·781
14	·7652	15	14·765
15	·7496	1	15·750
16	·7340	2	16·734
17	·7183	3	17·718
18	·7027	4	18·703
19	·6870	5	19·687
20	·6714	6	20·671
21	·6557	7	21·656
22	·6401	8	22·640
23	·6244	9	23·624
24	·6088	10	24·609
25	·5932	11	25·593
26	·5775	12	26·577
27	·5619	13	0·007
28	·5462	14	0·992
29	·5306	15	1·976

Jyeshṭha.

30	·5149	1	2·960
31	·4993	2	3·945
32	·4836	3	4·929
33	·4680	4	5·913
34	·4523	5	6·898
35	·4367	6	7·882
36	·4210	7	8·866
37	·4054	8	9·851
38	·3898	9	10·835
39	·3741	10	11·819
40	·3585	11	12·804
41	·3428	12	13·788
42	·3272	13	14·773
43	·3115	14	15·757
44	·2959	15	16·741
45	·2802	1	17·726
46	·2646	2	18·710
47	·2489	3	19·694
48	·2333	4	20·679
49	·2176	5	21·663
50	·2020	6	22·647
51	·1863	7	23·632
52	·1707	8	24·616
53	·1551	9	25·600
54	·1394	10	26·585
55	·1238	11	0·015
56	·1081	12	0·999
57	·0925	13	1·983
58	·0768	14	2·968
59	·0612	15	3·952

Āshāḍha.

60	·0455	1	4·936
61	·0299	2	5·921
62	·0142	3	6·905
62	·9986	4	7·889
63	·9829	5	8·874
64	·9673	6	9·858
65	·9516	7	10·842
66	·9360	8	11·827
67	·9203	9	12·811
68	·9047	10	13·795
69	·8891	11	14·780
70	·8734	12	15·764
71	·8578	13	16·749
72	·8421	14	17·733
73	·8265	15	18·717
74	·8108	1	19·702
75	·7952	2	20·686
76	·7795	3	21·670
77	·7639	4	22·655
78	·7482	5	23·639
79	·7326	6	24·623
80	·7169	7	25·608
81	·7013	8	26·592
82	·6856	9	0·022
83	·6700	10	1·006
84	·6543	11	1·991
85	·6387	12	2·975
86	·6231	13	3·959
87	·6074	14	4·944
88	·5918	15	5·928

Śrāvaṇa.

89	·5761	1	6·912
90	·5605	2	7·897
91	·5448	3	8·881
92	·5292	4	9·865
93	·5135	5	10·850
94	·4979	6	11·834
95	·4822	7	12·818
96	·4666	8	13·803
97	·4509	9	14·787
98	·4353	10	15·771
99	·4196	11	16·756
100	·4040	12	17·740
101	·3883	13	18·725
102	·3727	14	19·709
103	·3571	15	20·693
104	·3414	1	21·678
105	·3258	2	22·662
106	·3101	3	23·646
107	·2945	4	24·631
108	·2788	5	25·615
109	·2632	6	26·599
110	·2475	7	0·029
111	·2319	8	1·013
112	·2162	9	1·998
113	·2006	10	2·982
114	·1849	11	3·966
115	·1693	12	4·951
116	·1536	13	5·935
117	·1380	14	6·920
118	·1223	15	7·904

Bhādrapada.

119	·1067	1	8·888
120	·0911	2	9·873
121	·0754	3	10·857
122	·0598	4	11·841
123	·0441	5	12·826
124	·0285	6	13·810
125	·0128	7	14·794
125	·9972	8	15·779
126	·9815	9	16·763
127	·9659	10	17·747
128	·9502	11	18·732
129	·9346	12	19·716
130	·9189	13	20·700
131	·9033	14	21·685
132	·8876	15	22·669
133	·8720	1	23·654
134	·8563	2	24·638
135	·8407	3	25·622
136	·8251	4	26·607
137	·8094	5	0·036
138	·7938	6	1·021
139	·7781	7	2·005
140	·7625	8	2·989
141	·7468	9	3·974
142	·7312	10	4·958
143	·7155	11	5·942
144	·6999	12	6·927
145	·6842	13	7·911
146	·6686	14	8·896
147	·6529	15	9·880

Āśvina.

148	·6373	1	10·864
149	·6216	2	11·849
150	·6060	3	12·833
151	·5904	4	13·817
152	·5747	5	14·802
153	·5591	6	15·786
154	·5434	7	16·770
155	·5278	8	17·755
156	·5121	9	18·739
157	·4965	10	19·723
158	·4808	11	20·708
159	·4652	12	21·692
160	·4495	13	22·676
161	·4339	14	23·661
162	·4182	15	24·645
163	·4026	1	25·630
164	·3869	2	26·614
165	·3713	3	0·044
166	·3556	4	1·028
167	·3400	5	2·012
168	·3244	6	2·997
169	·3087	7	3·981
170	·2931	8	4·965
171	·2774	9	5·950
172	·2618	10	6·934
173	·2461	11	7·918
174	·2305	12	8·903
175	·2148	13	9·887
176	·1992	14	10·872
177	·1835	15	11·856

Kārttika.

178	·1679	1	12·840
179	·1522	2	13·825
180	·1366	3	14·809
181	·1209	4	15·793
182	·1053	5	16·778
183	·0896	6	17·762
184	·0740	7	18·746
185	·0584	8	19·731
186	·0427	9	20·715
187	·0271	10	21·699
188	·0114	11	22·684
188	·9958	12	23·668
189	·9801	13	24·652
190	·9645	14	25·637
191	·9488	15	26·621
192	·9332	1	0·051
193	·9175	2	1·035
194	·9019	3	2·020
195	·8862	4	3·004
196	·8706	5	3·988
197	·8549	6	4·973
198	·8393	7	5·957
199	·8236	8	6·941
200	·8080	9	7·926
201	·7924	10	8·910
202	·7767	11	9·894
203	·7611	12	10·879
204	·7454	13	11·863
205	·7298	14	12·848
206	·7141	15	13·832

Mārgaśīrsha.

207	·6985	1	14·816
208	·6828	2	15·801
209	·6672	3	16·785
210	·6515	4	17·769
211	·6359	5	18·754
212	·6202	6	19·738
213	·6046	7	20·722
214	·5889	8	21·707
215	·5733	9	22·691
216	·5576	10	23·675
217	·5420	11	24·660
218	·5264	12	25·644
219	·5107	13	26·628
220	·4951	14	0·058
221	·4794	15	1·043
222	·4638	1	2·027
223	·4481	2	3·011
224	·4325	3	3·996
225	·4168	4	4·980
226	·4012	5	5·964
227	·3855	6	6·949
228	·3699	7	7·933
229	·3542	8	8·917
230	·3386	9	9·902
231	·3229	10	10·886
232	·3073	11	11·870
233	·2916	12	12·855
234	·2760	13	13·839
235	·2604	14	14·824
236	·2447	15	15·808

Pausha.

237	·2291	1	16·792
238	·2134	2	17·777
239	·1978	3	18·761
240	·1821	4	19·745
241	·1665	5	20·730
242	·1508	6	21·714
243	·1352	7	22·698
244	·1195	8	23·683
245	·1039	9	24·667
246	·0882	10	25·651
247	·0726	11	26·636
248	·0569	12	0·065
249	·0413	13	1·050
250	·0257	14	2·034
251	·0108	15	3·019
251	·9944	1	4·003
252	·9787	2	4·987
253	·9631	3	5·972
254	·9474	4	6·956
255	·9318	5	7·940
256	·9161	6	8·925
257	·9005	7	9·909
258	·8848	8	10·893
259	·8692	9	11·878
260	·8535	10	12·862
261	·8379	11	13·846
262	·8222	12	14·831
263	·8066	13	15·815
264	·7909	14	16·799
265	·7753	15	17·784

Māgha.

266	·7597	1	18·768
267	·7440	2	19·753
268	·7284	3	20·737
269	·7127	4	21·721
270	·6971	5	22·706
271	·6814	6	23·690
272	·6658	7	24·674
273	·6501	8	25·659
274	·6345	9	26·643
275	·6188	10	0·078
276	·6032	11	1·057
277	·5875	12	2·041
278	·5719	13	3·026
279	·5562	14	4·010
280	·5406	15	4·995
281	·5249	1	5·979
282	·5093	2	6·963
283	·4937	3	7·948
284	·4780	4	8·932
285	·4624	5	9·916
286	·4467	6	10·901
287	·4311	7	11·885
288	·4154	8	12·869
289	·3998	9	13·854
290	·3841	10	14·838
291	·3685	11	15·822
292	·3528	12	16·807
293	·3372	13	17·791
294	·3215	14	18·775
295	·3059	15	19·760

Phālguna.

296	·2902	1	20·744
297	·2746	2	21·729
298	·2589	3	22·713
299	·2433	4	23·697
300	·2277	5	24·682
301	·2120	6	25·666
302	·1964	7	26·650
303	·1807	8	0·080
304	·1651	9	1·064
305	·1494	10	2·049
306	·1338	11	3·033
307	·1181	12	4·017
308	·1025	13	5·002
309	·0868	14	5·986
310	·0712	15	6·971
311	·0555	1	7·955
312	·0399	2	8·939
313	·0242	3	9·924
314	·0086	4	10·908
314	·9929	5	11·892
315	·9773	6	12·877
316	·9617	7	13·861
317	·9460	8	14·845
318	·9304	9	15·830
319	·9147	10	16·814
320	·8991	11	17·798
321	·8834	12	18·783
322	·8678	13	19·767
323	·8521	14	20·751
324	·8365	15	21·736

Chaitra (when there is no adhika masa).

325	·8208	1	22·720
326	·8052	2	23·705
327	·7895	3	24·689
328	·7739	4	25·673
329	·7582	5	26·658
330	·7426	6	0·087
331	·7269	7	1·072
332	·7113	8	2·056
333	·6957	9	3·040
334	·6800	10	4·025
335	·6644	11	5·009
336	·6487	12	5·993
337	·6331	13	6·978
338	·6174	14	7·962
339	·6018	15	8·947
340	·5861	1	9·931
341	·5705	2	10·915
342	·5548	3	11·900
343	·5392	4	12·884
344	·5235	5	13·868
345	·5079	6	14·853
346	·4922	7	15·837
347	·4766	8	16·821
348	·4610	9	17·806
349	·4453	10	18·790
350	·4297	11	19·774
351	·4140	12	20·759
352	·3984	13	21·743
353	·3827	14	22·727
354	·3671	15	23·712

Chaitra (when there is adhika masa).

355	·3514	1	24·696
356	·3358	2	25·681
357	·3201	3	26·665
358	·3045	4	0·095
359	·2888	5	1·079
360	·2732	6	2·063
361	·2575	7	3·048
362	·2419	8	4·032
363	·2262	9	5·016
364	·2106	10	6·001
365	·1950	11	6·985
366	·1793	12	7·969
367	·1637	13	8·954
368	·1480	14	9·938
369	·1324	15	10·923
370	·1167	1	11·907
371	·1011	2	12·891
372	·0854	3	13·876
373	·0698	4	14·860
374	·0541	5	15·844
375	·0385	6	16·829
376	·0228	7	17·813
377	·0072	8	18·797
377	·9915	9	19·782
378	·9759	10	20·766
379	·9602	11	21·750
380	·9446	12	22·735
381	·9290	13	23·719
382	·9133	14	24·703
383	·8977	15	25·688

e—EYE-TABLE FOR TITHIS.

Moon's anomaly and equation of the centre expressed in days and fractions of a day.

(SŪRYA SIDDHĀNTA.)

Eqn.	0	1	2	3	4	5	6	7	8	9
				Moon's anomaly in days.						
·00	·000	·011	·023	·034	·046	·057	·069	·081	·092	·104
·01	·115	·127	·138	·150	·162	·173	·185	·196	·208	·219
·02	·231	·242	·254	·265	·277	·289	·301	·313	·324	·336
·03	·347	·359	·370	·382	·393	·405	·416	·428	·439	·451
·04	·462	·474	·485	·497	·508	·520	·531	·543	·554	·566
·05	·577	·589	·600	·612	·623	·634	·646	·657	·669	·680
·06	·692	·703	·715	·726	·738	·749	·761	·772	·784	·795
·07	·807	·819	·831	·843	·855	·867	·879	·891	·903	·915
·08	·927	·939	·951	·962	·974	·985	·997	1·008	1·020	1·031
·09	1·043	1·055	1·067	1·079	1·091	1·103	1·115	1·127	1·139	1·151
·10	1·163	1·175	1·187	1·199	1·211	1·223	1·235	1·247	1·259	1·271
·11	1·283	1·295	1·307	1·319	1·331	1·343	1·355	1·367	1·379	1·391
·12	1·403	1·415	1·427	1·439	1·451	1·463	1·475	1·487	1·499	1·511
·13	1·523	1·535	1·547	1·559	1·571	1·583	1·595	1·608	1·620	1·632
·14	1·645	1·657	1·669	1·682	1·694	1·706	1·719	1·731	1·743	1·756
·15	1·768	1·780	1·793	1·805	1·817	1·830	1·842	1·854	1·867	1·879
·16	1·891	1·904	1·916	1·929	1·941	1·954	1·966	1·979	1·991	2·004
·17	2·016	2·029	2·041	2·054	2·066	2·079	2·091	2·104	2·117	2·129
·18	2·142	2·155	2·168	2·181	2·194	2·207	2·220	2·233	2·246	2·259
·19	2·272	2·285	2·298	2·311	2·324	2·337	2·350	2·363	2·376	2·389
·20	2·402	2·415	2·428	2·441	2·454	2·467	2·480	2·493	2·506	2·519
·21	2·533	2·546	2·560	2·573	2·587	2·600	2·614	2·627	2·641	2·654
·22	2·668	2·681	2·695	2·708	2·722	2·735	2·749	2·762	2·776	2·789
·23	2·803	2·817	2·831	2·845	2·859	2·873	2·887	2·901	2·915	2·929
·24	2·943	2·957	2·971	2·985	2·999	3·013	3·027	3·041	3·055	3·070
·25	3·085	3·099	3·113	3·127	3·141	3·155	3·169	3·183	3·198	3·213
·26	3·228	3·243	3·258	3·273	3·288	3·303	3·318	3·333	3·348	3·363
·27	3·378	3·398	3·408	3·423	3·437	3·453	3·468	3·484	3·499	3·515
·28	3·530	3·546	3·561	3·577	3·592	3·608	3·623	3·639	3·654	3·670
·29	3·686	3·702	3·718	3·734	3·750	3·767	3·783	3·800	3·816	3·833
·30	3·849	3·866	3·882	3·899	3·915	3·932	3·948	3·965	3·981	9·995
·31	4·014	4·031	4·048	4·065	4·083	4·100	4·118	4·135	4·153	4·170
·32	4·188	4·205	4·223	4·241	4·259	4·277	4·295	4·313	4·331	4·349
·33	4·368	4·387	4·407	4·426	4·445	4·465	4·484	4·503	4·523	4·542
·34	4·561	4·581	4·600	4·619	4·639	4·658	4·679	4·700	4·721	4·742
·35	4·763	4·784	4·805	4·826	4·847	4·868	4·889	4·910	4·931	4·953
·36	4·976	4·999	5·022	5·046	5·070	5·094	5·118	5·142	5·166	5·190
·37	5·214	5·238	5·262	5·288	5·315	5·342	5·369	5·396	5·423	5·450
·38	5·477	5·504	5·531	5·558	5·589	5·621	5·652	5·684	5·715	5·747
·39	5·778	5·810	5·841	5·879	5·917	5·955	5·993	6·031	6·069	6·107
·400	6·145	6·150	6·154	6·159	6·164	6·169	6·174	6·179	6·184	6·188
·401	6·193	6·198	6·202	6·207	6·212	6·216	6·222	6·227	6·232	6·236
·402	6·241	6·246	6·250	6·255	6·260	6·264	6·270	6·275	6·280	6·284
·403	6·289	6·294	6·298	6·303	6·308	6·312	6·318	6·323	6·328	6·333
·404	6·337	6·342	6·346	6·351	6·356	6·360	6·366	6·371	6·376	6·581
·405	6·386	6·391	6·395	6·399	6·404	6·408	6·414	6·419	6·424	6·428
·406	6·433	6·439	6·446	6·452	6·459	6·465	6·473	6·479	6·486	6·492
·407	6·499	6·505	6·512	6·518	6·525	6·531	6·539	6·545	6·552	6·558
·408	6·565	6·571	6·578	6·584	6·591	6·597	6·605	6·612	6·618	6·625
·409	6·631	6·638	6·644	6·651	6·657	6·664	6·671	6·678	6·684	6·691
·410	6·697	6·704	6·710	6·717	6·724	6·734	6·746	6·756	6·767	6·777
·411	6·788	6·798	6·809	6·819	6·830	6·840	6·852	6·862	6·873	6·883
·412	6·894	6·904	6·915	6·925	6·936	6·947	6·959	6·970	6·981	6·992
·413	7·003	7·014	7·050	7·086	7·122	7·158	7·195	7·231	7·267	7·303

Eqn.	9	8	7	6	5	4	3	2	1	0
				Moon's anomaly in days.						
·413	7·303	7·338	7·374	7·410	7·445	7·481	7·517	7·553	7·589	7·600
·412	7·611	7·622	7·633	7·644	7·654	7·665	7·676	7·686	7·697	7·707
·411	7·718	7·728	7·739	7·749	7·759	7·769	7·780	7·790	7·801	7·811
·410	7·822	7·832	7·843	7·853	7·863	7·873	7·880	7·887	7·893	7·900
·409	7·906	7·913	7·919	7·928	7·931	7·938	7·944	7·951	7·957	7·964
·408	7·970	7·977	7·983	7·990	7·996	8·002	8·049	8·015	8·022	8·028
·407	8·035	8·041	8·048	8·054	8·060	8·066	8·073	8·079	8·086	8·092
·406	8·099	8·105	8·112	8·118	8·124	8·130	8·137	8·143	8·150	8·156
·405	8·161	8·165	8·170	8·175	8·179	8·183	8·188	8·193	8·197	8·202
·404	8·207	8·211	8·216	8·221	8·225	8·229	8·234	8·239	8·243	8·248
·403	8·252	8·257	8·262	8·267	8·271	8·275	8·280	8·285	8·289	8·294
·402	8·299	8·303	8·308	8·313	8·317	8·321	8·326	8·331	8·335	8·340
·401	8·345	8·349	8·354	8·359	8·363	8·367	8·372	8·377	8·381	8·386
·400	8·391	8·395	8·400	8·405	8·409	8·413	8·418	8·423	8·427	8·432
·39	8·468	8·504	8·540	8·576	8·612	8·648	8·684	8·720	8·749	8·779
·38	8·808	8·838	8·867	8·897	8·926	8·956	8·985	9·010	9·035	9·060
·37	9.085	9·110	9·135	9·160	9·185	9·210	9·235	9·259	9·281	9·303
·36	9·325	9·347	9·369	9·391	9·413	9·435	9·457	9·479	9·500	9·521
·35	9·542	9·562	9·581	9·600	9·619	9·638	9·657	9·676	9·695	9·714
·34	9·733	9·752	9·771	9·790	9·809	9·826	9·844	9·861	9·878	9·896
·33	9·913	9·930	9·948	9·965	9·982	10·000	10·017	10·034	10·052	10·069
·32	10·086	10·102	10·118	10·134	10·150	10·166	10·182	10·198	10·214	10·229
·31	10·245	10·260	10·276	10·291	10·307	10·322	10·338	10·353	10·368	10·383
·30	10·397	10·412	10·426	10·441	10·455	10·470	10·484	10·499	10·513	10·528
·29	10·542	10·557	10·571	10·586	10·600	10 615	10·629	10 643	10 657	10·671
·28	10·685	10·699	10 712	10·726	10·739	10·753	10·766	10·780	10·793	10·807
·27	10·820	10 834	10·847	10·861	10·874	10·888	10·900	10·913	10·926	10·939
·26	10·952	10·965	10 978	10·991	11·004	11·017	11 030	11·043	11·056	11·069
·25	11·082	11·095	11·108	11·120	11·132	11 144	11·156	11·168	11·180	11·192
·24	11·205	11·218	11·230	11·242	11·254	11·266	11·278	11·290	11·302	11·314
·23	11·326	11·338	11·350	11·362	11·374	11·386	11·398	11·410	11·422	11·434
·22	11·446	11·457	11·469	11·480	11·492	11·503	11·515	11·526	11·538	11·549
·21	11·561	11·572	11·584	11·595	11·607	11 618	11 630	11·641	11·653	11·664
·20	11·676	11·687	11·698	11·709	11·720	11·731	11·742	11·753	11·764	11·775
·19	11·786	11·797	11·808	11·819	11·830	11·841	11 852	11·863	11 874	11·885
·18	11·896	11·907	11·918	11·929	11·940	11·951	11·962	11·974	11·984	11·995
·17	12·006	12·016	12·027	12·038	12·048	12·059	12·069	12·080	12·090	12·101
·16	12·111	12·122	12·132	12·143	12·153	12·164	12·174	12·185	12·195	12·206
·15	12·216	12·226	12·237	12·247	12·257	12·268	12·278	12·288	12·299	12·309
·14	12·319	12·330	12·340	12·350	12·361	12·371	12·381	12·392	12·402	12·412
·13	12·423	12·433	12·443	12·454	12·464	12·474	12·484	12·494	12·504	12·514
·12	12·524	12·534	12·544	12·554	12·564	12·574	12·584	12·594	12·604	12·614
·11	12·624	12·634	12·644	12·654	12·664	12·674	12·684	12·694	12·704	12·714
·10	12·724	12·734	12·744	12·754	12·764	12·774	12·784	12·794	12·804	12·814
·09	12·824	12·834	12·844	12·854	12·864	12·874	12·884	12·894	12·904	12·914
·08	12·924	12·933	12·943	12·952	12·962	12·971	12 981	12·990	13·000	13·010
·07	13·020	13·030	13·040	13·050	13·060	13·070	13·080	13·090	13·100	13·110
·06	13·120	13·129	13·139	13·148	13·158	13·167	13·177	13 186	13·196	13·205
·05	13·215	13·224	13·234	13·243	13 253	13·262	13·271	13·281	13·290	13.300
·04	13·309	13·319	13·328	13·338	13·347	13·357	13·366	13·376	13·385	13·395
·03	13·404	13·414	13·423	13·433	13·442	13·452	13·461	13·471	13·480	13·490
·02	13·499	13·509	13·518	13·528	13·538	13·548	13·558	13·567	13·577	13·586
·01	13·596	13·605	13 615	13·624	13·634	13·643	13·653	13·663	13·672	13·682
·00	13·691	13·701	13·710	13·720	13·730	13·739	13·749	13·758	13·768	13·777

e—EYE-TABLE FOR TITHIS—*continued.*

Moon's anomaly and equation of the centre expressed in days and fractions of a day.

(SŪRYA SIDDHĀNTA.)

Eqn. +	0	1	2	3	4	5	6	7	8	9	Eqn. +	9	8	7	6	5	4	3	2	1	0
	Moon's anomaly in days.											Moon's anomaly in days.									
·00	13·777	13·786	13·796	13·805	13·815	13·824	13·834	13·844	13·853	13·863	**·413**	20·252	20·287	20·323	20·359	20·396	20·432	20·468	20·504	20·540	20·551
·01	13·872	13·882	13·891	13·901	13·911	13·920	13·930	13·939	13·949	13·958	**·412**	20·562	20·573	20·584	20·595	20·607	20·618	20·629	20·639	20·650	20·660
·02	13·968	13·977	13·987	13·996	14·006	14·016	14·026	14·036	14·045	14·055	**·411**	20·671	20·681	20·692	20·702	20·714	20·724	20·735	20·745	20·756	20·766
·03	14·064	14·074	14·083	14·093	14·102	14·112	14·121	14·131	14·140	14·150	**·410**	20·777	20·787	20·798	20·808	20·820	20·830	20·837	20·844	20·850	20·857
·04	14·159	14·169	14·178	14·188	14·197	14·207	14·216	14·226	14·235	14·245	**·409**	20·863	20·870	20·876	20·883	20·890	20·897	20·903	20·910	20·916	20·923
·05	14·255	14·264	14·273	14·283	14·292	14·301	14·311	14·320	14·330	14·339	**·408**	20·929	20·936	20·942	20·949	20·957	20·963	20·970	20·976	20·983	20·989
·06	14·349	14·358	14·368	14·377	14·387	14·396	14·406	14·415	14·425	14·434	**·407**	20·996	21·002	21·009	21·015	21·023	21·029	21·036	21·042	21·049	21·055
·07	14·444	14·454	14·464	14·474	14·484	14·494	14·504	14·514	14·524	14·534	**·406**	21·062	21·068	21·075	21·081	21·089	21·095	21·102	21·108	21·115	21·121
·08	14·544	14·554	14·564	14·573	14·583	14·592	14·602	14·611	14·621	14·630	**·405**	21·125	21·129	21·134	21·139	21·145	21·149	21·154	21·159	21·163	21·168
·09	14·640	14·650	14·660	14·670	14·680	14·690	14·700	14·710	14·720	14·730	**·404**	21·178	21·177	21·182	21·187	21·193	21·197	21·202	21·207	21·211	21·216
·10	14·740	14·750	14·760	14·770	14·780	14·790	14·800	14·810	14·820	14·830	**·403**	21·220	21·225	21·230	21·235	21·241	21·245	21·250	21·255	21·259	21·264
·11	14·840	14·850	14·860	14·870	14·880	14·890	14·900	14·910	14·920	14·930	**·402**	21·269	21·273	21·278	21·283	21·289	21·293	21·298	21·303	21·307	21·312
·12	14·940	14·950	14·960	14·970	14·980	14·990	15·000	15·010	15·020	15·030	**·401**	21·317	21·321	21·326	21·331	21·337	21·342	21·347	21·352	21·356	21·361
·13	15·040	15·050	15·060	15·070	15·080	15·090	15·100	15·111	15·121	15·131	**·400**	21·366	21·370	21·375	21·380	21·386	21·390	21·395	21·400	21·404	21·409
·14	15·142	15·152	15·162	15·173	15·183	15·193	15·204	15·214	15·224	15·235	**·39**	21·447	21·485	21·523	21·561	21·599	21·637	21·675	21·713	21·744	21·776
·15	15·245	15·255	15·266	15·276	15·286	15·297	15·307	15·317	15·328	15·338	**·38**	21·807	21·839	21·870	21·902	21·933	21·965	21·996	22·023	22·050	22·077
·16	15·348	15·359	15·369	15·380	15·390	15·401	15·411	15·422	15·432	15·443	**·37**	22·104	22·131	22·158	22·185	22·212	22·239	22·266	22·292	22·316	22·340
·17	15·453	15·464	15·474	15·485	15·495	15·506	15·516	15·527	15·538	15·548	**·36**	22·364	22·388	22·412	22·436	22·460	22·484	22·508	22·532	22·555	22·578
·18	15·559	15·570	15·581	15·592	15·603	15·614	15·625	15·636	15·647	15·658	**·35**	22·601	22·623	22·644	22·665	22·686	22·707	22·728	22·749	22·770	22·791
·19	15·669	15·680	15·691	15·702	15·713	15·724	15·735	15·746	15·757	15·768	**·34**	22·812	22·833	22·854	22·875	22·896	22·915	22·935	22·954	22·973	22·993
·20	15·779	15·790	15·801	15·812	15·823	15·834	15·845	15·856	15·867	15·878	**·33**	23·012	23·031	23·051	23·070	23·089	23·109	23·128	23·147	23·167	23·186
·21	15·890	15·901	15·913	15·924	15·936	15·947	15·959	15·970	15·982	15·993	**·32**	23·205	23·223	23·241	23·259	23·277	23·295	23·313	23·331	23·349	23·366
·22	16·005	16·016	16·028	16·039	16·051	16·062	16·074	16·085	16·097	16·108	**·31**	23·384	23·401	23·419	23·436	23·454	23·471	23·489	23·506	23·523	23·540
·23	16·120	16·132	16·144	16·156	16·168	16·180	16·192	16·204	16·216	16·228	**·30**	23·556	23·573	23·589	23·606	23·622	23·639	23·655	23·672	23·688	23·705
·24	16·240	16·252	16·264	16·276	16·288	16·300	16·312	16·324	16·336	16·349	**·29**	23·721	23·738	23·754	23·771	23·787	23·804	23·820	23·836	23·852	23·868
·25	16·362	16·374	16·386	16·398	16·410	16·422	16·434	16·446	16·459	16·472	**·28**	23·884	23·900	23·915	23·931	23·946	23·962	23·977	23·993	24·008	24·024
·26	16·485	16·498	16·511	16·524	16·537	16·550	16·563	16·576	16·589	16·602	**·27**	24·039	24·055	24·070	24·086	24·101	24·117	24·131	24·146	24·161	24·176
·27	16·615	16·628	16·641	16·654	16·666	16·680	16·693	16·707	16·720	16·734	**·26**	24·191	24·206	24·221	24·236	24·251	24·266	24·281	24·296	24·311	24·326
·28	16·747	16·761	16·774	16·788	16·801	16·815	16·828	16·842	16·855	16·869	**·25**	24·341	24·356	24·371	24·385	24·399	24·413	24·427	24·441	24·455	24·469
·29	16·883	16·897	16·911	16·926	16·940	16·955	16·969	16·984	16·998	17·013	**·24**	24·484	24·499	24·513	24·527	24·541	24·555	24·569	24·583	24·597	24·611
·30	17·027	17·042	17·056	17·071	17·085	17·100	17·114	17·129	17·143	17·158	**·23**	24·625	24·639	24·653	24·667	24·681	24·695	24·709	24·723	24·737	24·751
·31	17·172	17·187	17·202	17·217	17·233	17·248	17·264	17·279	17·295	17·310	**·22**	24·765	24·778	24·792	24·805	24·819	24·832	24·846	24·859	24·873	24·886
·32	17·326	17·341	17·357	17·373	17·389	17·405	17·421	17·437	17·453	17·469	**·21**	24·900	24·913	24·927	24·940	24·954	24·967	24·981	24·994	25·008	25·021
·33	17·486	17·503	17·521	17·538	17·555	17·573	17·590	17·607	17·625	17·642	**·20**	25·035	25·048	25·061	25·074	25·087	25·100	25·113	25·126	25·139	25·152
·34	17·659	17·677	17·694	17·711	17·729	17·746	17·765	17·784	17·803	17·822	**·19**	25·165	25·178	25·191	25·204	25·217	25·230	25·243	25·256	25·269	25·282
·35	17·841	17·860	17·879	17·898	17·917	17·936	17·955	17·974	17·993	18·013	**·18**	25·295	25·308	25·321	25·334	25·347	25·360	25·373	25·386	25·399	25·412
·36	18·034	18·055	18·076	18·098	18·120	18·142	18·164	18·186	18·208	18·230	**·17**	25·425	25·437	25·450	25·463	25·475	25·488	25·500	25·513	25·525	25·538
·37	18·252	18·274	18·296	18·320	18·345	18·370	18·395	18·420	18·445	18·470	**·16**	25·550	25·563	25·575	25·588	25·600	25·613	25·625	25·638	25·650	25·663
·38	18·495	18·520	18·545	18·570	18·599	18·629	18·658	18·688	18·717	18·747	**·15**	25·675	25·687	25·700	25·712	25·724	25·737	25·749	25·761	25·774	25·786
39	18·776	18·806	18·835	18·871	18·907	18·943	18·979	19·015	19·051	19·087	**·14**	25·798	25·811	25·823	25·835	25·848	25·860	25·872	25·885	25·897	25·909
·400	19·123	19·128	19·132	19·137	19·142	19·146	19·150	19·155	19·160	19·164	**·13**	25·922	25·934	25·946	25·959	25·971	25·983	25·995	26·007	26·019	26·031
·401	19·169	19·174	19·178	19·183	19·188	19·193	19·197	19·202	19·207	19·211	**·12**	26·043	26·055	26·067	26·079	26·091	26·103	26·115	26·127	26·139	26·151
·402	19·216	19·221	19·225	19·230	19·235	19·239	19·243	19·248	19·253	19·257	**·11**	26·163	26·175	26·187	26·199	26·211	26·223	26·235	26·247	26·259	26·271
·403	19·262	19·267	19·271	19·276	19·281	19·285	19·289	19·294	19·299	19·304	**·10**	26·283	26·295	26·307	26·319	26·331	26·343	26·355	26·367	26·379	26·391
·404	19·308	19·313	19·317	19·322	19·327	19·331	19·335	19·340	19·345	19·349	**·09**	26·403	26·415	26·427	26·439	26·451	26·463	26·475	26·487	26·499	26·511
·405	19·354	19·359	19·363	19·368	19·373	19·377	19·381	19·386	19·391	19·395	**·08**	26·523	26·534	26·546	26·557	26·569	26·580	26·592	26·603	26·615	26·627
·406	19·399	19·405	19·412	19·418	19·425	19·431	19·437	19·443	19·450	19·456	**·07**	26·639	26·651	26·663	26·675	26·687	26·699	26·711	26·723	26·735	26·747
·407	19·463	19·469	19·476	19·482	19·489	19·495	19·501	19·507	19·514	19·520	**·06**	26·759	26·770	26·782	26·793	26·805	26·816	26·828	26·839	26·851	26·862
·408	19·527	19·533	19·540	19·546	19·553	19·559	19·565	19·572	19·578	19·585	**·05**	26·874	26·885	26·897	26·908	26·920	26·931	26·942	26·954	26·965	26·977
·409	19·591	19·598	19·604	19·611	19·617	19·624	19·629	19·636	19·642	19·649	**·04**	26·988	27·000	27·011	27·023	27·034	27·046	27·057	27·069	27·080	27·092
·410	19·655	19·662	19·668	19·675	19·682	19·692	19·702	19·712	19·723	19·733	**·03**	27·103	27·115	27·126	27·138	27·149	27·161	27·172	27·184	27·195	27·207
·411	19·744	19·754	19·765	19·775	19·786	19·796	19·806	19·816	19·827	19·837	**·02**	27·218	27·230	27·242	27·254	27·266	27·278	27·290	27·301	27·313	27·324
·412	19·848	19·858	19·869	19·879	19·890	19·901	19·911	19·922	19·933	19·944	**·01**	27·336	27·347	27·359	27·370	27·382	27·393	27·405	27·417	27·428	27·440
·413	19·955	19·966	20·002	20·038	20·074	20·110	20·145	20·181	20·217	20·252	**·00**	27·451	27·463	27·474	27·486	27·498	27·509	27·521	27·532	27·544	27·555

f—EYE-TABLE FOR NAKSHATRAS.

Moon's anomaly and moon's equation of the centre in days and fractions of a day.

(SŪRYA SIDDHĀNTA.)

Eqn.	0	1	2	3	4	5	6	7	8	9
	Moon's anomaly in days.									
·00	0·000	0·012	0·024	0·037	0·049	0·061	0·074	0·086	0·098	0·111
·01	0·123	0·135	0·148	0·160	0·173	0·185	0·198	0·210	0·223	0·236
·02	0·248	0·260	0·272	0·285	0·297	0·310	0·322	0·335	0·347	0·360
·03	0·372	0·384	0·397	0·409	0·421	0·434	0·446	0·459	0·471	0·484
·04	0·496	0·508	0·520	0·533	0·545	0·557	0·570	0·582	0·594	0·607
·05	0·619	0·631	0·643	0·655	0·668	0·680	0·693	0·705	0·717	0·730
·06	0·742	0·755	0·768	0·780	0·793	0·806	0·818	0·831	0·844	0·856
·07	0·869	0·882	0·895	0·907	0·920	0·933	0·945	0·958	0·971	0·983
·08	0·996	1·009	1·022	1·034	1·047	1·060	1·072	1·085	1·098	1·110
·09	1·123	1·135	1·148	1·161	1·174	1·187	1·200	1·213	1·226	1·239
·10	1·252	1·264	1·277	1·290	1·303	1·316	1·329	1·342	1·355	1·368
·11	1·381	1·393	1·406	1·419	1·432	1·445	1·458	1·471	1·484	1·497
12	1·510	1·523	1·536	1·549	1·562	1·575	1·588	1·601	1·614	1·627
·13	1·640	1·653	1·666	1·680	1·693	1·706	1·720	1·733	1·746	1·760
·14	1·773	1·786	1·799	1·812	1·826	1·839	1·852	1·865	1·878	1·891
·15	1·905	1·918	1·932	1·945	1·959	1·972	1·986	1·999	2·013	2·026
·16	2·040	2·053	2·067	2·080	2·094	2·107	2·121	2·134	2·148	2·162
·17	2·176	2·190	2·204	2·218	2·232	2·246	2·260	2·274	2·288	2·302
·18	2·316	2·330	2·344	2·358	2·372	2·386	2·400	2·414	2·428	2·442
·19	2·457	2·471	2·485	2·500	2·514	2·528	2·543	2·557	2·571	2·585
·20	2·600	2·614	2·629	2·643	2·658	2·672	2·687	2·701	2·716	2·730
·21	2·745	2·759	2·774	2·789	2·803	2·818	2·833	2·848	2·863	2·877
·22	2·893	2·908	2·923	2·938	2·953	2·969	2·984	2·999	3·014	3·029
·23	3·045	3·060	3·076	3·091	3·107	3·122	3·138	3·153	3·169	3·184
·24	3·200	3·216	3·232	3·248	3·264	3·280	3·296	3·312	3·328	3·344
·25	3·360	3·377	3·393	3·410	3·426	3·443	3·459	3·476	3·492	3·509
·26	3·525	3·542	3·559	3·575	3·592	3·609	3·625	3·642	3·659	3·676
·27	3·693	3·711	3·729	3·746	3·764	3·782	3·799	3·817	3·835	3·852
·28	3·870	3·887	3·905	3·923	3·941	3·959	3·977	3·995	4·013	4·031
·29	4·049	4·067	4·086	4·105	4·124	4·143	4·160	4·179	4·198	4·218
·30	4·238	4·258	4·278	4·299	4·319	4·340	4·360	4·381	4·401	4·422
·31	4·442	4·462	4·483	4·504	4·525	4·546	4·567	4·588	4·609	4·630
·32	4·651	4·673	4·696	4·718	4·741	4·763	4·786	4·808	4·831	4·854
·33	4·877	4·902	4·927	4·952	4·977	5·002	5·027	5·052	5·077	5·102
·34	5·127	5·154	5·182	5·209	5·237	5·264	5·292	5·319	5·347	5·375
·35	5·403	5·434	5·465	5·497	5·529	5·561	5·593	5·625	5·657	5·689
·36	5·721	5·760	5·799	5·838	5·877	5·916	5·955	5·994	6·033	6·072
·370	6·111	6·115	6·120	6·124	6·129	6·135	6·141	6·147	6·152	6·158
·371	6·163	6·168	6·172	6·178	6·184	6·190	6·196	6·200	6·205	6·210
·372	6·215	6·220	6·225	6·230	6·234	6·240	6·246	6·252	6·257	6·263
·373	6·269	6·274	6·279	6·283	6·287	6·293	6·298	6·303	6·309	6·313
·374	6·318	6·323	6·328	6·333	6·338	6·345	6·350	6·355	6·360	6·365
·375	6·370	6·375	6·380	6·385	6·390	6·397	6·403	6·409	6·416	6·422
·376	6·429	6·436	6·443	6·450	6·457	6·465	6·472	6·479	6·486	6·493
·377	6·500	6·507	6·514	6·521	6·528	6·536	6·543	6·550	6·557	6·564
·378	6·571	6·578	6·585	6·592	6·599	6·607	6·614	6·621	6·628	6·635
·379	6·643	6·651	6·659	6·668	6·676	6·685	6·694	6·702	6·710	6·719
·380	6·727	6·788	6·749	6·761	6·772	6·784	6·796	6·807	6·818	6·830
·381	6·841	6·853	6·865	6·876	6·888	6·900	6·912	6·923	6·935	6·947
·382	6·959	6·971	6·983	7·019	7·055	7·092	7·128	7·164	7·200	7·236
·383	7·272									

Eqn.	9	8	7	6	5	4	3	2	1	0
				Moon's anomaly in days.						
·383										7·272
·382	7·308	7·344	7·380	7·416	7·452	7·487	7·523	7·558	7·572	7·582
·381	7·594	7·606	7·618	7·629	7·641	7·651	7·663	7·674	7·685	7·697
·380	7·709	7·721	7·732	7·743	7·755	7·765	7·776	7·788	7·799	7·810
·379	7·818	7·827	7·835	7·843	7·852	7·859	7·867	7·876	7·884	7·892
·378	7·900	7·907	7·914	7·921	7·928	7·934	7·941	7·948	7·955	7·962
·377	7·969	7·976	7·983	7·990	7·997	8·003	8·010	8·017	8·024	8·031
·376	8·038	8·045	8·052	8·059	8·066	8·072	8·079	8·086	8·093	8·100
·375	8·107	8·113	8·120	8·126	8·132	8·137	8·142	8·147	8·152	8·157
·374	8·162	8·167	8·172	8·177	8·182	8·187	8·192	8·197	8·202	8·207
·373	8·212	8·217	8·222	8·227	8·232	8·236	8·240	8·244	8·249	8·254
·372	8·260	8·266	8·271	8·277	8·283	8·287	8·291	8·296	8·301	8·306
·371	8·311	8·316	8·321	8·325	8·331	8·335	8·341	8·347	8·351	8·356
·370	8·361	8·367	8·372	8·378	8·384	8·388	8·393	8·397	8·402	8·406
·36	8·443	8·480	8·517	8·554	8·591	8·628	8·665	8·702	8·739	8·776
·35	8·806	8·836	8·866	8·896	8·926	8·956	8·986	9·016	9·045	9·074
·34	9·100	9·126	9·152	9·177	9·203	9·228	9·254	9·279	9·305	9·330
·33	9·353	9·376	9·399	9·422	9·445	9·468	9·491	9·514	9·537	9·560
·32	9·581	9·602	9·623	9·643	9·664	9·684	9·705	9·725	9·746	9·766
·31	9·785	9·804	9·823	9·842	9·861	9·880	9·899	9·918	9·937	9·955
·30	9·973	9·992	10·010	10·039	10·057	10·066	10·084	10·103	10·121	10·139
·29	10·157	10·175	10·192	10·209	10·224	10·241	10·258	10·275	10·292	10·308
·28	10·324	10·340	10·356	10·372	10·388	10·404	10·420	10·436	10·452	10·467
·27	10·483	10·498	10·514	10·530	10·545	10·561	10·577	10·592	10·608	10·624
·26	10·639	10·654	10·669	10·684	10·698	10·713	10·728	10·742	10·757	10·772
·25	10·786	10·801	10·815	10·830	10·844	10·859	10·873	10·888	10·902	10·916
·24	10·931	10·945	10·959	10·973	10·987	11·001	11·015	11·029	11·043	11·057
·23	11·071	11·084	11·098	11·111	11·125	11·138	11·152	11·165	11·179	11·192
·22	11·206	11·219	11·232	11·245	11·258	11·272	11·285	11·298	11·311	11·324
·21	11·338	11·350	11·363	11·376	11·388	11·401	11·414	11·426	11·439	11·452
·20	11·465	11·477	11·490	11·502	11·515	11·527	11·540	11·552	11·565	11·577
·19	11·590	11·602	11·614	11·626	11·639	11·651	11·663	11·676	11·688	11·700
·18	11·713	11·725	11·737	11·749	11·761	11·773	11·785	11·797	11·809	11·821
·17	11·833	11·845	11·857	11·869	11·881	11·893	11·905	11·917	11·929	11·941
·16	11·953	11·965	11·977	11·988	12·000	12·011	12·023	12·034	12·046	12·057
·15	12·069	12·080	12·092	12·103	12·115	12·126	12·138	12·149	12·161	12·172
·14	12·184	12·195	12·206	12·217	12·228	12·239	12·251	12·262	12·273	12·284
·13	12·295	12·307	12·318	12·329	12·341	12·352	12·363	12·375	12·386	12·397
·12	12·408	12·419	12·430	12·441	12·452	12·463	12·474	12·485	12·496	12·507
·11	12·518	12·529	12·540	12·551	12·562	12·573	12·584	12·595	12·606	12·616
·10	12·627	12·638	12·649	12·660	12·671	12·682	12·693	12·704	12·715	12·725
·09	12·736	12·747	12·758	12·769	12·780	12·791	12·802	12·813	12·824	12·834
·08	12·845	12·855	12·866	12·877	12·887	12·898	12·909	12·919	12·930	12·941
·07	12·952	12·962	12·973	12·984	12·994	13·005	13·016	12·026	13·037	13·048
·06	13·059	13·069	13·080	13·091	13·101	13·112	13·123	13·133	18·144	13·155
·05	13·165	13·176	13·186	13·196	13·207	13·217	13·227	13·238	13·248	13·258
·04	13·268	13·279	13·289	13·299	13·310	13·320	13·330	13·341	13·351	13·361
·03	13·371	13·382	13·392	13·408	13·418	13·424	13·434	13·444	13·455	13·465
·02	13·475	13·486	13·496	13·507	13·517	13·528	13·538	13·549	13·559	13·569
·01	13·579	13·590	13·601	13·611	13·622	13·632	13·643	13·653	13·664	13·674
·00	13·684	13·695	13·705	13·715	13·726	13·736	13·746	13·757	13·767	13·777

f—EYE-TABLE FOR NAKSHATRAS—*continued.*

Moon's anomaly and moon's equation of the centre in days and fractions of a day.

(SŪRYA SIDDHĀNTA.)

Eqn. +	0	1	2	3	4	5	6	7	8	9
	Moon's anomaly in days.									
·00	13·777	13·787	13·797	13·808	13·818	13·828	13·839	13·849	13·859	13·870
·01	13·880	13·890	13·901	13·911	13·922	13·932	13 943	13·953	13 964	13·975
·02	13·985	13·995	14·005	14·016	14·026	14·037	14·047	14·058	14 068	14·079
·03	14·089	14·099	14·110	14·120	14·130	14·141	14·151	14·162	14·172	14·183
·04	14·193	14·203	14·213	14·224	14·234	14·244	14·255	14·265	14·275	14·286
·05	14·296	14·306	14·316	14·327	14 337	14 347	14·358	14·368	14·378	14·389
·06	14·399	14·410	14·421	14·431	14·442	14 453	14·463	14·474	14·485	14·495
·07	14·505	14·517	14·528	14·538	14·549	14 560	14·570	14·581	14·592	14·602
·08	14·613	14·624	14·635	14·645	14·656	14·667	14·677	14 688	14·699	14·709
·09	14·720	14·730	14·741	14·752	14·763	14·774	14·785	14·796	14·807	14·818
·10	14·829	14·839	14·850	14·861	14·872	14·883	14·894	14·905	14·916	14·927
·11	14·938	14·948	14·959	14·970	14·981	14·992	15·003	15·014	15·025	15·036
·12	15·047	15·058	15·069	15·080	15·091	15·102	15·113	15·124	15·135	15·146
·13	15·157	15·168	15·179	15·191	15·202	15·213	15·225	15·236	15·247	15·259
·14	15·270	15·281	15·292	15·303	15·315	15·326	15·337	15·348	15·359	15·370
·15	15·382	15·393	15·405	15·416	15·428	15·439	15·451	15·462	15·474	15·485
·16	15·497	15·508	15·520	15 531	15·543	15·554	15·566	15·577	15 589	15·601
·17	15·613	15 625	15·637	15 649	15·661	15·673	15·685	15·697	15·709	15·721
·18	15·733	15·745	15·757	15·769	15·781	15·793	15·805	15·817	15·829	15·841
19	15·854	15·866	15·878	15·891	15 903	15·915	15·928	15·940	15·952	15·964
·20	15·977	15·989	16 002	16·014	16·027	16·039	16·052	16·064	16·077	16·089
·21	16·102	16·115	16·128	16·140	16·153	16·166	16·178	16·191	16·204	16·216
·22	16·230	16·243	16 256	16·269	16·282	16·296	16·309	16·322	16·335	16·348
·23	16·362	16·375	16·389	16·402	16·416	16·429	16 443	16·456	16·470	16·483
·24	16·497	16·511	16 525	16 539	16·553	16·567	16 581	16·595	16·609	16 623
·25	16·638	16·652	16·666	16·681	16·695	16·710	16·724	16·739	16·753	16·768
·26	16.782	16·797	16·812	16·826	16·841	16·856	16·870	16·885	16·900	16·915
·27	16·930	16·946	16·962	16·977	16·993	17·009	17·024	17·040	17·056	17·071
·28	17·087	17·102	17·118	17·134	17·150	17·176	17·182	17·198	17·214	17·230
·29	17·246	17·263	17·280	17·297	17·314	17·331	17·348	17·365	17 382	17·399
·30	17·416	17·434	17·452	17·471	17·489	17·508	17·526	17·545	17·563	17·582
·31	17·600	17·618	17·637	17·656	17·675	17·694	17·713	17·732	17·751	17·770
·32	17·789	17.809	17·830	17·850	17·871	17·891	17·912	17·932	17·953	17·974
·33	17·995	18·018	18·041	18·064	18·087	18·110	18·133	18·156	18·179	18·202
·34	18·225	18·250	18·276	18·301	18·327	18·352	18·378	18·403	18·429	18·455
·35	18·481	18·510	18·539	18·569	18·599	18·629	18·659	18·689	18·719	18·749
·36	18·779	18.816	18·853	18·890	18·927	18·964	19·001	19·038	19·075	19·112
·370	19.149	19·153	19·158	19·162	19·167	19·172	19·177	19·183	19·188	19·194
·371	19·199	19·204	19·208	19·214	19·220	19·226	19·231	19·235	19·240	19·245
·372	19·250	19 255	19·260	19·265	19·269	19.274	19·279	19·285	19·290	19·296
·373	19·302	19·307	19·312	19·316	19·320	19·325	19·329	19·334	19·339	19·344
·374	19·349	19·354	19·359	19·364	19·369	19·375	19·379	19·384	19·389	19·394
·375	19.399	19·404	19·409	19·414	19·419	19·425	19·430	19·436	19·442	19·448
·376	19·455	19·462	19·469	19·476	19·483	19·490	19·496	19·503	19·510	19·517
·377	19·524	19·531	19·538	19·545	19·552	19·559	19.565	19.572	19·579	19·586
·378	19·593	19·600	19·607	19·614	19·621	19·628	19·634	19·641	19.648	19·655
·379	19·663	19·671	19·679	19·688	19·696	19·704	19.712	19·720	19·728	19·737
·380	19·745	19·756	19·767	19·779	19·790	19.801	19·812	19·823	19·834	19·845
·381	19·858	19 870	19 882	19·893	19 905	19.916	19.927	19.938	19·950	19·962
·382	19·974	19·986	19·997	20·032	20·068	20·104	20·139	20·175	20·211	20·247
·383	20·283									

Eqn. +	9	8	7	6	5	4	3	2	1	0
	Moon's anomaly in days.									
										20·283
·383										
·382	20·319	20·355	20·391	20·427	20·464	20·500	20·536	20·571	20·582	20·594
·381	20·606	20·618	20·630	20·641	20·654	20·655	20·677	20·688	20·700	20·712
·380	20·724	20·736	20·747	20·759	20·771	20·782	20·793	20·805	20·816	20·827
·379	20·835	20·844	20·852	20 860	20·870	20 878	20·886	20·895	20·903	20·911
·378	20·919	20·926	20·933	20·940	20·948	20·955	20·962	20·969	20·976	20·983
·377	20·990	20·997	21·004	21·011	21·019	21·026	21·033	21·040	21·047	21·054
·376	21·061	21·068	21·075	21 082	21·090	21·097	21·104	21·111	21·118	21·125
·375	21·132	21·138	21·144	21·150	21·157	21·163	21·168	21·173	21·178	21·183
·374	21·188	21·193	21·198	21·203	21·209	21·215	21·220	21·225	21·230	21·235
373	21·240	21·245	21·250	21·255	21·261	21·266	21·270	21·274	21·279	21·284
·372	21·290	21·296	21·301	21·307	21·314	21·319	21·323	21·328	21·333	21·338
·371	21·343	21·348	21·353	21·357	21·364	21·370	21 376	21·382	21 386	21·391
·370	21·396	21·402	21·407	21·413	21 420	21·425	21·430	21·434	21 439	21·443
·36	21·482	21·521	21·560	21·599	21·638	21·677	21·716	21·755	21·794	21·833
·35	21·865	21·897	21·929	21·961	21·993	22·025	22·057	22 089	22·120	22·151
·34	22·179	22·207	22·235	22·262	22·290	22·317	22·345	22·372	22·400	22·427
·33	22·452	22·477	22·502	22·527	22·552	22·577	22·602	22·627	22·652	22·677
·32	22·700	22·723	22 746	22·768	22·791	22·813	22·836	22·858	22 881	22 903
·31	22·924	22·945	22·966	22 987	23·008	23·029	23·050	23 071	23·092	23·112
·30	23·132	23·153	23·173	23·194	23·214	23·235	23·255	23·276	23·296	23·316
·29	23·336	23·356	23·375	23·394	23·411	23·430	23·449	23·468	23·487	23·505
·28	23·523	23·541	23·559	23·577	23·595	23 613	23·631	23·649	23·667	23·684
·27	23·702	23·719	23·737	23·755	23·772	23·790	23·808	23·825	23·843	23·861
·26	23·878	23·895	23·912	23·929	23 945	23·962	23 979	23·995	24·012	24·029
·25	24·045	24·062	24·078	24·095	24·111	24·128	24·144	24·161	24·177	24·193
·24	24·210	24·226	24·242	24·258	24·274	24·290	24·306	24·322	24·338	24·354
·23	24·370	24·385	24·401	24·416	24·432	24·447	24·463	24.478	24·494	24·509
·22	24·525	24·540	24 555	24·570	24·585	24·601	24 616	24·631	24·646	24·661
·21	24·677	24·691	24·706	24·721	24·735	24·750	24·765	24·779	24·794	24 809
·20	24·824	24·838	24.853	24·867	24·882	24·896	24·911	24 925	24·940	24·954
·19	24·969	24·983	24·997	25·011	25·026	25·040	25·054	25·069	25·083	25·097
·18	25·112	25·126	25·140	25·154	25·168	25·182	25·196	25·210	25·224	25·238
·17	25.252	25·266	25·280	25·294	25·308	25·322	25·336	25·350	25 364	25·378
·16	25·392	25·406	25 420	25·433	25·447	25·460	25 474	25·487	25·501	25 514
·15	25·528	25·541	25·555	25·568	25 582	25·595	25·609	25·622	25·636	25·649
·14	25 663	25·676	25·689	25·702	25·715	25 728	25·742	25·755	25·768	25 781
·13	25 794	25·808	25 821	25·834	25·848	25·861	25·874	25.888	25 901	25·914
·12	25 927	25·940	25·953	25·966	25.979	25·992	26·005	26·018	26 031	26 044
·11	26·057	26 070	26 083	26·096	26 109	26·122	26·135	26·148	26·161	26·173
·10	26 186	26·199	26 212	26·225	26·238	26·251	26·264	26·277	26·290	26·302
·09	26·315	26·328	26·341	26·354	26·367	26.380	26·393	26 406	26·419	26·431
·08	26·444	26·456	26·469	26·482	26·494	26·507	26·520	26·532	26·545	26·558
·07	26·571	26·583	26 596	26·609	26·621	26·634	26·647	26·659	26 672	26·685
·06	26 698	26·710	26·723	26·736	26·748	26·761	26.774	26·786	26·799	26·812
·05	26·824	26·837	26·849	26·861	26·874	26·886	26·898	26·911	26·923	26.935
·04	26·947	26·960	26·972	26·984	26 997	27·009	27·021	27·034	27·046	27·058
·03	27·070	27 083	27·095	27·108	27·120	27·133	27·145.	27·157	27·170	27·182
·02	27·194	27·207	27·219	27·232	27·244	27·257	27·269	27·282	27·294	27·307
·01	27·319	27.332	27·345	27·357	27·370	27 382	27·395	27·407	27·420	27·432
·00	27·444	27·457	27·469	27·481	27·494	27·506	27·518	27·531	27·543	27·555

g—EYE-TABLE FOR YOGAS.

Moon's anomaly and moon's equation of the centre in days and fractions of a day.

(SŪRYA SIDDHĀNTA.)

Eqn.	0	1	2	3	4	5	6	7	8	9
–	Moon's anomaly in days.									
·00	·000	·013	·026	·039	·052	·065	·078	·091	·104	·117
·01	·130	·143	·156	·169	·183	·196	·209	·223	·236	·249
·02	·262	·275	·288	·302	·316	·329	·343	·356	·369	·383
·03	·396	·409	·423	·436	·449	·463	·476	·489	·503	·516
·04	·529	·543	·556	·569	·583	·596	·609	·622	·635	·649
·05	·662	·675	·689	·702	·715	·729	·742	·755	·769	·782
·06	·795	·809	·822	·835	·848	·862	·875	·889	·903	·917
·07	·931	·945	·958	·972	·986	·999	1·013	1·027	1·041	1·054
·08	1·068	1·082	1·095	1·109	1·123	1·136	1·150	1·164	1·178	1·191
·09	1·205	1·219	1·232	1·246	1·260	1·273	1·287	1·301	1·315	1·328
·10	1·342	1·356	1·369	1·383	1·397	1·410	1·424	1·438	1·452	1·465
·11	1·479	1·493	1·506	1·520	1·534	1·547	1·561	1·575	1·590	1·604
·12	1·618	1·632	1·646	1·661	1·675	1·689	1·704	1·718	1·732	1·747
·13	1·761	1·775	1·789	1·804	1·818	1·832	1·846	1·860	1·875	1·889
·14	1·904	1·919	1·933	1·948	1·962	1·977	1·991	2·005	2·019	2·033
·15	2·047	2·062	2·076	2·091	2·105	2·120	2·134	2·149	2·163	2·178
·16	2·192	2·207	2·221	2·236	2·251	2·266	2·281	2·296	2·311	2·326
·17	2·341	2·356	2·371	2·386	2·401	2·416	2·431	2·446	2·461	2·476
·18	2·492	2·507	2·523	2·538	2·554	2·570	2·585	2·601	2·616	2·632
·19	2·648	2·663	2·679	2·694	2·710	2·726	2·741	2·757	2·772	2·788
·20	2·804	2·820	2·836	2·852	2·868	2·885	2·901	2·917	2·933	2·949
·21	2·965	2·981	2·997	3·013	3·029	3·046	3·062	3·078	3·095	3·112
·22	3·129	3·146	3·163	3·180	3·197	3·214	3·231	3·248	3·265	3·282
·23	3·299	3·316	3·333	3·350	3·367	3·384	3·401	3·419	3·437	3·455
·24	3·473	3·491	3·509	3·527	3·545	3·563	3·581	3·599	3·617	3·635
·25	3·653	3·671	3·689	3·707	3·726	3·745	3·764	3·783	3·802	3·821
26	3·840	3·859	3·878	3·897	3·916	3·935	3·954	3·973	3·993	4·013
·27	4·033	4·054	4·074	4·094	4·114	4·135	4·155	4·175	4·196	4·216
·28	4·236	4·257	4·278	4·299	4·321	4·344	4·366	4·389	4·411	4·433
·29	4·456	4·478	4·501	4·523	4·545	4·568	4·590	4·612	4·636	4·660
·30	4·685	4·709	4·733	4·758	4·782	4·806	4·831	4·855	4·880	4·904
·31	4·931	4·958	4·985	5·012	5·039	5·066	5·094	5·122	5·150	5·178
·32	5·205	5·236	5·267	5·298	5·329	5·360	5·391	5·422	5·453	5·484
·33	5·516	5·552	5·589	5·625	5·662	5·698	5·735	5·772	5·809	5·853
·34	5·897	5·942	5·986	6·030	6·075	6·132	6·189	6·246	6·303	6·360
·350	6·417	6·424	6·432	6·439	6·447	6·454	6·462	6·469	6·477	6·485
·351	6·493	6·500	6·508	6·515	6·523	6·530	6·538	6·545	6·553	6·561
·352	6·569	6·576	6·584	6·591	6·599	6·606	6·614	6·621	6·629	6·637
·353	6·645	6·661	6·677	6·693	6·709	6·725	6·741	6·757	6·773	6·788
·354	6·804	6·820	6·836	6·852	6·868	6·884	6·900	6·916	6·932	6·947
·355	6·963	6·979	6·995	7·011	7·027	7·043	7·059	7·075	7·091	7·106
·356	7·122	7·163	7·204	7·245	...	...	...	...	...	...

Eqn.	9	8	7	6	5	4	3	2	1	0
–	Moon's anomaly in days.									
·356	...	...	...	...	...	...	7·245	7·286	7·327	7·368
·355	7·384	7·399	7·415	7·431	7·446	7·462	7·478	7·494	7·509	7·525
·354	7·541	7·556	7·572	7·588	7·603	7·619	7·635	7·651	7·666	7·682
·353	7·698	7·713	7·729	7·745	7·760	7·776	7·792	7·808	7·823	7·839
·352	7·846	7·854	7·861	7·869	7·876	7·884	7·891	7·899	7·906	7·914
·351	7·921	7·929	7·936	7·944	7·951	7·959	7·966	7·974	7·981	7·989
·350	7·996	8·004	8·011	8·019	8·026	8·034	8·041	8·049	8·056	8·063
·34	8·118	8·173	8·228	8·283	8·338	8·393	8·434	8·476	8·518	8·560
·33	8·602	8·644	8·678	8·713	8·747	8·782	8·816	8·851	8·885	8·920
·32	8·949	8·978	9·007	9·036	9·065	9·094	9·123	9·152	9·181	9·210
·31	9·235	9·261	9·286	9·312	9·337	9·363	9·388	9·414	9·439	9·465
·30	9·490	9·512	9·535	9·557	9·580	9·602	9·625	9·647	9·670	9·692
·29	9·715	9·737	9·759	9·779	9·800	9·820	9·841	9·861	9·882	9·902
·28	9·923	9·943	9·964	9·984	10·005	10·025	10·045	10·064	10·083	10·102
·27	10·121	10·139	10·157	10·175	10·193	10·211	10·229	10·247	10·265	10·283
·26	10·300	10·317	10·334	10·351	10·368	10·385	10·402	10·419	10·436	10·453
·25	10·473	10·490	10·507	10·524	10·541	10·558	10·575	10·591	10·607	10·623
·24	10·639	10·655	10·671	10·687	10·703	10·719	10·735	10·751	10·767	10·783
·23	10·799	10·815	10·831	10·847	10·862	10·877	10·892	10·907	10·922	10·937
·22	10·952	10·967	10·982	10·997	11·012	11·027	11·042	11·057	11·072	11·087
·21	11·102	11·117	11·132	11·147	11·162	11·177	11·191	11·205	11·219	11·233
·20	11·247	11·261	11·275	11·289	11·303	11·317	11·331	11·345	11·359	11·373
·19	11·387	11·401	11·415	11·429	11·443	11·456	11·470	11·483	11·497	11·510
·18	11·524	11·537	11·551	11·564	11·578	11·591	11·605	11·618	11·632	11·645
·17	11·659	11·672	11·685	11·698	11·711	11·724	11·737	11·750	11·763	11·776
·16	11·789	11·802	11·815	11·828	11·841	11·854	11·867	11·880	11·893	11·905
·15	11·918	11·930	11·943	11·955	11·968	11·980	11·993	12·005	12·018	12·030
·14	12·043	12·055	12·068	12·080	12·093	12·105	12·118	12·130	12·143	12·155
·13	12·168	12·180	12·192	12·205	12·218	12·231	12·243	12·255	12·269	12·279
·12	12·291	12·303	12·315	12·327	12·339	12·351	12·363	12·375	12·387	12·399
·11	12·411	12·423	12·435	12·447	12·459	12·471	12·483	12·495	12·507	12·519
·10	12·531	12·543	12·555	12·567	12·579	12·591	12·603	12·615	12·627	12·639
·09	12·650	12·662	12·673	12·685	12·696	12·708	12·719	12·731	12·743	12·755
·08	12·767	12·778	12·790	12·801	12·813	12·824	12·836	12·847	12·859	12·870
·07	12·882	12·893	12·905	12·916	12·928	12·939	12·951	12·962	12·974	12·986
·06	12·997	13·009	13·020	13·032	13·043	13·055	13·066	13·078	13·089	13·101
·05	13·112	13·124	13·135	13·147	13·158	13·170	13·181	13·193	13·204	13·216
·04	13·227	13·238	13·249	13·260	13·271	13·282	13·293	13·305	13·316	13·327
·03	13·338	13·349	13·361	13·372	13·383	13·394	13·405	13·417	13·428	13·439
·02	13·450	13·461	13·472	13·483	13·494	13·505	13·516	13·527	13·538	13·550
·01	13·561	13·572	13·584	13·595	13·606	13·618	13·629	13·640	13·652	13·663
·00	13·674	13·686	13·697	13·708	13·720	13·731	13·742	13·754	13·765	13·777

9—EYE-TABLE FOR YOGAS—*continued.*

Moon's anomaly and moon's equation of the centre in days and fractions of a day.

(SŪRYA SIDDHĀNTA.)

Eqn. +	0	1	2	3	4	5	6	7	8	9	Eqn. +	9	8	7	6	5	4	3	2	1	0
	Moon's anomaly in days.											Moon's anomaly in days.									
·00	13·777	13·789	13·800	13·812	13·823	13·834	13·846	13·857	13·868	13·880	·356	...	...	...	...	...	...	20·310	20·351	20·392	20·432
·01	13·891	13·902	13·914	13·925	13·936	13·948	13·959	13·970	13·982	13·993	·355	20·448	20·464	20·470	20·486	20·502	20·518	20·534	20·550	20·566	20·572
·02	14·005	14·016	14·028	14·040	14·051	14·062	14·073	14·084	14·095	14·106	·354	20·607	20·623	20·639	20·655	20·671	20·687	20·703	20·719	20·735	20·751
·03	14·117	14·128	14·139	14·151	14·162	14·173	14·184	14·195	14·206	14·217	·353	20·766	20·782	20·798	20·814	20·830	20·846	20·862	20·878	20·894	20·910
·04	14·228	14·239	14·250	14·261	14·272	14·283	14·294	14·305	14·316	14·327	·352	20·918	20·927	20·935	20·944	20·952	20·960	20·969	20·977	20·986	20·994
·05	14·338	14·350	14·361	14·373	14·384	14·396	14·407	14·419	14·430	14·442	·351	21·092	21·011	21·019	21·028	21·036	21·044	21·053	21·061	21·070	21·078
·06	14·453	14·465	14·476	14·488	14·499	14·511	14·522	14·534	14·545	14·557	·350	21·086	21·095	21·103	21·112	21·120	21·128	21·137	21·145	21·153	21·161
·07	14·568	14·580	14·592	14·603	14·615	14·626	14·638	14·649	14·661	14·672	·34	21·214	21·267	21·320	21·373	21·426	21·479	21·523	21·568	21·612	21·657
·08	14·684	14·695	14·707	14·718	14·730	14·741	14·753	14·764	14·776	14·787	·33	21·701	21·745	21·782	21·819	21·856	21·892	21·929	21·965	22·002	22·038
·09	14·799	14·811	14·823	14·835	14·846	14·858	14·869	14·881	14·892	14·904	·32	22·070	22·101	22·132	22·163	22·194	22·225	22·256	22·287	22·318	22·349
·10	14·915	14·927	14·939	14·951	14·963	14·975	14·987	14·999	15·011	15·023	·31	22·376	22·403	22·430	22·457	22·484	22·511	22·538	22·567	22·596	22·623
·11	15·035	15·047	15·059	15·071	15·083	15·095	15·107	15·119	15·131	15·143	·30	22·650	22·675	22·699	22·723	22·748	22·772	22·796	22·821	22·845	22·869
·12	15·155	15·167	15·179	15·191	15·203	15·215	15·227	15·239	15·251	15·263	·29	22·894	22·918	22·942	22·955	22·978	23·001	23·024	23·047	23·070	23·093
·13	15·275	15·287	15·299	15·311	15·323	15·336	15·349	15·362	15·374	15·386	·28	23·115	23·137	23·160	23·182	23·204	23·227	23·249	23·270	23·291	23·312
·14	15·389	15·411	15·424	15·436	15·449	15·461	15·474	15·486	15·499	15·511	·27	23·333	23·354	23·375	23·396	23·417	23·438	23·459	23·480	23·500	23·520
·15	15·524	15·536	15·549	15·561	15·574	15·586	15·599	15·611	15·624	15·636	·26	23·541	23·561	23·581	23·600	23·619	23·638	23·657	23·676	23·695	23·714
·16	15·649	15·661	15·674	15·687	15·700	15·713	15·726	15·739	15·752	15·765	·25	23·733	23·752	23·771	23·790	23·809	23·828	23·847	23·865	23·883	23·901
·17	15·778	15·791	15·804	15·817	15·830	15·843	15·856	15·869	15·882	15·895	·24	23·919	23·937	23·955	23·973	23·991	24·009	24·027	24·045	24·063	24·081
·18	15·909	15·922	15·936	15·949	15·963	15·976	15·990	16·003	16·017	16·030	·23	24·099	24·117	24·135	24·153	24·171	24·188	24·205	24·222	24·239	24·256
·19	16·044	16·057	16·071	16·084	16·098	16·111	16·125	16·139	16·153	16·167	·22	24·273	24·290	24·307	24·324	24·341	24·358	24·375	24·392	24·409	24·426
·20	16·181	16·195	16·209	16·223	16·237	16·251	16·265	16·279	16·293	16·307	·21	24·443	24·460	24·477	24·494	24·511	24·528	24·544	24·560	24·576	24·592
·21	16·321	16·335	16·349	16·363	16·377	16·391	16·406	16·420	16·435	16·450	·20	24·608	24·624	24·640	24·656	24·671	24·688	24·702	24·718	24·734	24·750
·22	16·465	16·480	16·495	16·510	16·525	16·540	16·555	16·570	16·585	16·600	·19	24·766	24·782	24·797	24·813	24·828	24·844	24·860	24·875	24·891	24·906
·23	16·615	16·630	16·645	16·660	16·676	16·691	16·707	16·723	16·739	16·755	·18	24·922	24·938	24·953	24·969	24·984	25·000	25·016	25·031	25·047	25·062
·24	16·771	16·787	16·803	16·819	16·835	16·851	16·867	16·883	16·899	16·915	·17	25·078	25·093	25·108	25·123	25·138	25·153	25·168	25·183	25·198	25·218
·25	16·931	16·947	16·963	16·980	16·997	17·014	17·031	17·048	17·065	17·082	·16	25·228	25·243	25·258	25·273	25·288	25·303	25·318	25·333	25·347	25·362
·26	17·099	17·116	17·133	17·150	17·167	17·183	17·200	17·217	17·235	17·253	·15	25·376	25·391	25·405	25·419	25·433	25·448	25·462	25·477	25·491	25·506
·27	17·271	17·289	17·308	17·326	17·345	17·363	17·382	17·400	17·419	17·437	·14	25·520	25·534	25·548	25·562	25·576	25·591	25·605	25·620	25·635	25·650
·28	17·456	17·474	17·493	17·511	17·531	17·551	17·571	17·591	17·611	17·631	·13	25·665	25·679	25·694	25·708	25·722	25·736	25·750	25·765	25·779	25·793
·29	17·651	17·671	17·691	17·711	17·731	17·752	17·773	17·794	17·816	17·839	·12	25·807	25·821	25·836	25·850	25·865	25·879	25·893	25·908	25·922	25·936
·30	17·861	17·884	17·906	17·929	17·951	17·974	17·996	18·019	18·041	18·063	·11	25·950	25·964	25·979	25·993	26·007	26·021	26·035	26·049	26·062	26·076
·31	18·088	18·114	18·139	18·165	18·190	18·216	18·241	18·267	18·292	18·318	·10	26·090	26·103	26·117	26·131	26·145	26·158	26·172	26·186	26·199	26·213
·32	18·343	18·372	18·401	18·430	18·459	18·488	18·517	18·546	18·575	18·604	·09	26·227	26·240	26·254	26·268	26·282	26·295	26·309	26·322	26·335	26·349
·33	18·634	18·668	18·703	18·737	18·772	18·806	18·841	18·875	18·910	18·352	·08	26·363	26·376	26·390	26·404	26·418	26·431	26·445	26·459	26·472	26·486
·34	18·994	19·036	19·078	19·121	19·164	19·218	19·272	19·327	19·382	19·437	·07	26·500	26·513	26·527	26·541	26·555	26·568	26·582	26·596	26·609	26·623
·350	19·492	19·499	19·507	19·514	19·522	19·529	19·537	19·544	19·551	19·558	·06	26·637	26·651	26·665	26·679	26·692	26·706	26·719	26·732	26·745	26·759
·351	19·566	19·573	19·581	19·588	19·596	19·603	19·611	19·618	19·626	19·633	·05	26·772	26·785	26·799	26·812	26·825	26·839	26·852	26·865	26·879	26·892
·352	19·640	19·647	19·655	19·662	19·670	19·677	19·685	19·692	19·700	19·707	·04	26·905	26·919	26·932	26·945	26·958	26·971	26·985	26·998	27·011	27·025
·353	19·715	19·730	19·745	19·760	19·775	19·790	19·805	19·820	19·835	19·850	·03	27·038	27·051	27·065	27·078	27·091	27·105	27·118	27·131	27·145	27·158
·354	19·865	19·880	19·895	19·910	19·925	19·940	19·955	19·970	19·985	20·000	·02	27·171	27·185	27·198	27·211	27·225	27·238	27·252	27·266	27·279	27·292
·355	20·017	20·034	20·051	20·068	20·085	20·102	20·119	20·136	20·153	20·170	·01	27·305	27·319	27·332	27·346	27·359	27·372	27·386	27·399	27·412	27·425
·356	20·186	20·227	20·268	20·310	...	...	...	...	...	...	·00	27·438	27·451	27·464	27·477	27·490	27·503	27·516	27·529	27·542	27·555

h—EYE-TABLE FOR TITHIS.

Sun's anomaly expressed as days of the solar year and sun's equation of the centre in fractions of a day.

(SŪRYA SIDDHĀNTA.)

Eqn. +	9	8	7	6	5	4	3	2	1	0
	Sun's anomaly in days of the solar year.									
·175	...	...	...	...	...	365·13	0·07	0·27	0·47	0·62
·174	0·77	0·92	1·07	1·22	1·37	1·52	1·67	1·82	1·96	2·11
·173	2·25	2·40	2·54	2·68	2·82	2·97	3·11	3·26	3·40	3·55
·172	3·69	3·84	3·98	4·13	4·28	4·39	4·51	4·63	4·75	4·87
·171	4·99	5·11	5·23	5·35	5·47	5·59	5·71	5·83	5·95	6·07
·170	6·19	6·31	6·43	6·55	6·67	6·79	6·91	7·03	7·15	7·27
·16	8·28	9·23	10·18	11·13	12·06	12·86	13·65	14·47	15·27	16·03
·15	16·76	17·44	18·15	18·86	19·57	20·19	20·82	21·45	22·07	22·70
·14	23·32	23·89	24·45	25·02	25·60	26·17	26·74	27·29	27·82	28·34
·13	28·85	29·37	29·89	30·41	30·94	31·43	31·91	32·39	32·87	33·35
·12	33·83	34·31	34·79	35·24	35·70	36·16	36·61	37·06	37·51	37·96
·11	38·41	38·84	39·27	39·69	40·13	40·55	40·98	41·40	41·83	42·25
·10	42·65	43·05	43·46	43·86	44·27	44·68	45·08	45·48	45·89	46·29
·09	46·66	47·05	47·43	47·82	48·21	48·60	48·98	49·37	49·75	50·13
·08	50·49	50·86	51·23	51·60	51·97	52·34	52·71	53·08	53·45	53·82
·07	54·17	54·52	54·88	55·24	55·60	55·96	56·32	56·68	57·03	57·39
·06	57·73	58·08	58·43	58·78	59·13	59·48	59·83	60·18	60·52	60·87
·05	61·21	61·55	61·89	62·23	62·18	62·92	63·26	63·60	63·94	64·28
·04	64·60	64·94	65·28	65·61	65·95	66·29	66·62	66·95	67·28	67·61
·03	67·93	68·26	68·59	68·92	69·26	69·59	69·91	70·24	70·57	70·89
·02	71·21	71·53	71·86	72·18	72·52	72·85	73·17	73·49	73·81	74·14
·01	74·45	74·77	75·09	75·41	75·75	76·07	76·39	76·71	77·03	77·35
·00	77·66	77·98	78·30	78·62	78·95	79·27	79·59	79·91	80·23	80·55

Eqn. −	0	1	2	3	4	5	6	7	8	9
	Sun's anomaly in days of the solar year.									
·00	80·55	80·87	81·19	81·51	81·83	82·15	82·48	82·80	83·12	83·44
·01	83·75	84·06	84·38	84·71	85·03	85·35	85·68	86·01	86·33	86·65
·02	86·96	87·28	87·61	87·93	88·25	88·58	88·91	89·24	89·56	89·89
·03	90·21	90·53	90·86	91·18	91·51	91·84	92·17	92·50	92·84	93·17
·04	93·49	93·82	94·15	94·48	94·81	95·14	95·48	95·81	96·15	96·49
·05	96·82	97·16	97·50	97·84	98·18	98·52	98·87	99·20	99·64	99·89
·06	100·23	100·57	100·92	101·27	101·62	101·96	102·32	102·67	103·02	103·36
·07	103·71	104·06	104·42	104·78	105·14	105·49	105·86	106·22	106·57	106·93
·08	107·28	107·65	108·02	108·38	108·75	109·12	109·50	109·87	110·24	110·61
·09	110·97	111·35	111·73	112·12	112·50	112·89	113·28	113·67	114·05	114·43
·10	114·81	115·21	115·61	116·02	116·42	116·82	117·24	117·64	118·04	118·44
·11	118·85	119·27	119·70	120·12	120·55	120·97	121·41	121·83	122·26	122·69
·12	123·13	123·58	124·04	124·49	124·94	125·39	125·86	126·31	126·79	127·27
·13	127·74	128·22	128·71	129·19	129·67	130·15	130·69	131·21	131·73	132·25
·14	132·76	133·28	133·80	134·36	134·93	135·49	136·07	136·94	137·21	137·78
·15	138·40	139·02	139·65	140·28	140·90	141·53	142·24	142·95	143·66	144·37
·16	145·07	145·83	146·63	147·43	148·24	149·04	149·97	150·92	151·87	152·82
·170	153·82	153·94	154·06	154·18	154·30	154·42	154·54	154·66	154·78	154·90
·171	155·02	155·14	155·26	155·38	155·50	155·62	155·74	155·86	155·98	156·10
·172	156·22	156·34	156·46	156·58	156·70	156·81	156·95	157·10	157·24	157·39
·173	157·53	157·68	157·82	157·97	158·11	158·26	158·41	158·55	158·69	158·84
·174	158·98	159·13	159·27	159·42	159·57	159·72	159·87	160·02	160·17	160·32
·175	160·47	160·62	160·82	161·02	161·22	161·42	161·63	161·83	162·03	162·23
·176	162·43	162·63	162·83	163·03	163·23	163·43	163·63	163·83	164·03	164·23
·177	164·43	164·77	165·12	165·46	165·81	166·15	166·50	166·85	167·19	167·54
·178	167·89	168·24	169·50	170·77	172·04	...	...	...	...	...

Eqn. −	9	8	7	6	5	4	3	2	1	0
	Sun's anomaly in days of the solar year.									
·178	...	...	...	...	...	172·04	173·31	174·58	175·84	176·19
·177	176·54	176·89	177·23	177·58	177·93	178·27	178·62	178·96	179·31	179·65
·176	179·85	180·05	180·25	180·45	180·65	180·85	181·05	181·25	181·45	181·65
·175	181·85	182·05	182·25	182·45	182·64	182·84	183·04	183·24	183·44	183·59
·174	183·74	183·89	184·04	184·19	184·34	184·49	184·64	184·79	184·93	185·08
·173	185·22	185·37	185·51	185·65	185·80	185·95	186·09	186·24	186·38	186·53
·172	186·67	186·82	186·96	187·11	187·25	187·36	187·48	187·60	187·72	187·84
·171	187·96	188·08	188·20	188·32	188·44	188·56	188·68	188·80	188·92	189·04
·170	189·16	189·28	189·40	189·52	189·64	189·76	189·88	190·00	190·12	190·24
·16	191·26	192·21	193·16	194·11	195·02	195·82	196·62	197·42	198·22	198·98
·15	199·70	200·40	201·11	201·82	202·51	203·13	203·76	204·38	205·01	205·63
·14	206·26	206·83	207·40	207·96	208·52	209·09	209·66	210·21	210·73	211·15
·13	211·78	212·30	212·81	213·33	213·84	214·32	214·80	215·28	215·76	216·24
·12	216·73	217·21	217·69	218·14	218·58	219·03	219·48	219·93	220·38	220·83
·11	221·30	221·73	222·15	222·57	222·99	223·41	223·83	224·25	224·68	225·10
·10	225·52	225·92	226·32	226·72	227·11	227·52	227·92	228·32	228·72	229·12
·09	229·51	229·89	230·28	230·66	231·03	231·41	231·80	232·18	232·56	232·94
·08	233·32	233·68	234·05	234·42	234·77	235·14	235·51	235·88	236·24	236·61
·07	236·97	237·33	237·68	238·04	238·38	238·74	239·09	239·45	239·80	240·16
·06	240·52	240·87	241·21	241·56	241·89	242·24	242·58	242·93	243·28	243·62
·05	243·98	244·32	244·66	244·99	245·32	245·66	245·99	246·33	246·67	247·01
·04	247·35	247·69	248·03	248·36	248·67	249·00	249·33	249·66	249·99	250·32
·03	250·66	250·99	251·32	251·65	251·96	252·29	252·61	252·93	253·26	253·58
·02	253·91	254·24	254·56	254·89	255·20	255·52	255·84	256·17	256·49	256·81
·01	257·14	257·46	257·78	258·10	258·41	258·73	259·05	259·37	259·68	260·00
·00	260·33	260·65	260·96	261·28	261·59	261·91	262·23	262·54	262·86	263·18

Eqn. +	0	1	2	3	4	5	6	7	8	9
	Sun's anomaly in days of the solar year.									
·00	263·18	263·50	263·81	264·13	264·45	264·77	265·07	265·39	265·71	266·03
·01	266·36	266·67	266·99	267·31	267·63	267·95	268·26	268·58	268·90	269·21
·02	269·55	269·87	270·19	270·51	270·83	271·96	271·47	271·79	272·12	272·44
·03	272·78	273·10	273·42	273·75	274·07	274·40	274·71	275·04	275·37	275·70
·04	276·04	276·37	276·70	277·02	277·35	277·68	278·00	278·33	278·67	279·00
·05	279·35	279·69	280·03	280·36	280·70	281·04	281·36	281·70	282·04	282·38
·06	282·74	283·08	283·43	283·77	284·12	284·46	284·80	285·14	285·49	285·84
·07	286·20	286·55	286·91	287·26	287·62	287·97	288·32	288·67	289·03	289·38
·08	289·75	290·12	290·48	290·85	291·22	291·58	291·94	292·31	292·67	293·04
·09	293·42	293·79	294·18	294·56	294·94	295·33	295·70	296·08	296·46	296·85
·10	297·24	297·64	298·04	298·44	298·84	299·24	299·63	300·04	300·47	300·84
·11	301·26	301·68	302·10	302·53	302·95	303·37	303·78	304·21	304·63	305·06
·12	305·52	305·97	306·42	306·87	307·32	307·77	308·21	308·66	309·14	309·62
·13	310·11	310·59	311·07	311·55	312·03	312·51	313·02	313·54	314·06	314·58
·14	315·11	315·63	316·15	316·70	317·27	317·84	318·39	318·96	319·53	320·09
·15	320·73	321·35	321·98	322·60	323·22	323·85	324·54	325·25	325·95	326·66
·16	327·38	328·13	328·94	329·74	330·54	331·34	332·25	533·20	334·14	335·09
·170	336·11	336·23	336·35	336·47	336·59	336·71	336·83	336·95	337·07	337·19
·171	337·31	337·43	337·55	337·67	337·79	337·91	338·03	338·15	338·27	338·39
·172	338·51	338·63	338·75	338·87	338·99	339·10	339·24	338·39	339·53	339·68
·173	339·82	339·97	340·11	340·26	340·40	340·55	340·70	340·84	340·98	341·13
·174	341·27	341·42	341·56	341·71	341·86	342·01	342·16	342·31	343·46	342·61
·175	342·76	342·91	343·11	343·31	343·51	343·71	343·90	344·10	344·30	344·50
·176	344·70	344·90	345·10	345·30	345·50	345·70	345·90	346·10	346·30	346·50
·177	346·70	347·04	347·39	347·73	348·08	348·42	348·99	349·12	349·46	349·81
·178	350·16	350·51	350·77	351·04	351·31	...	...	...	...	...

Eqn. +	9	8	7	6	5	4	3	2	1	0
	Sun's anomaly in days of the solar year.									
·178	...	...	...	...	...	354·31	355·58	356·85	358·11	358·46
·177	358·81	359·16	359·50	359·85	360·20	363·44	360·79	361·13	361·48	361·92
·176	362·12	362·32	362·52	362·72	362·92	363·12	363·32	363·52	363·72	363·92
·175	364·12	364·32	364·52	364·72	364·93	365·13	...	...	...	...

i—EYE-TABLE FOR YOGAS.

Sun's anomaly expressed as days of the solar year and sun's equation of the centre in fractions of a day.

(SŪRYA SIDDHÂNTA.)

Eqn. −	9	8	7	6	5	4	3	2	1	0
	Sun's anomaly in days of the solar year.									
·151	...	...	...	...	...	...	...	...	...	0·08
·150	0·32	0·56	0·79	1·00	1·21	1·42	1·63	1·84	2·05	2·26
·14	3·73	5·15	6·57	7·99	9·09	10·19	11·29	12·39	13·32	14·24
·13	15·16	16·08	16·95	17·82	18·68	19·54	20·25	20·96	21·67	22·38
·12	23·09	23·80	24·50	25·20	25·88	26·57	27·26	27·95	28·51	29·07
·11	29·63	30·19	30·75	31·31	31·86	32·42	32·98	33·54	34·10	34·66
·10	35·22	35·74	36·26	36·78	37·29	37·81	38·33	38·84	39·34	39·84
·09	40·33	40·82	41·31	41·80	42·28	42·77	43·24	43·71	44·18	44·65
·08	45·12	45·59	46·06	46·52	46·96	47·40	47·85	48·29	48·73	49·17
07	49·61	50·05	50·48	50·92	51·33	51·76	52·19	52·62	53·05	53·48
·06	53·90	54·32	54·73	55·14	55·52	55·96	56·37	56·79	57·20	57·61
·05	58·02	58·42	58·83	59·23	59·63	60·03	60·44	60·84	61·25	61·65
·04	62·05	62·45	62·84	63·23	63·61	64·00	64·39	64·78	65·17	65·55
·03	65·94	66·32	66·71	67·09	67·47	67·85	68·24	68·62	69·01	69·39
·02	69·77	70·14	70·52	70·89	71·26	71·63	72·01	72·38	72·76	73·13
·01	73·50	73·88	74·25	74·63	74·99	75·37	75·74	76·12	76·49	76·86
·00	77·23	77·60	77·97	78·34	78·70	79·07	79·44	79·81	80·18	80·55

Eqn. +	0	1	2	3	4	5	6	7	8	9
	Sun's anomaly in days of the solar year.									
·00	80·55	80·91	81·28	81·65	82·02	82·39	82·75	83·12	83·49	83·86
·01	84·23	84·60	84·97	85·35	85·72	86·10	86·46	86·84	87·21	87·59
·02	87·96	88·33	88·71	89·08	89·46	89·83	90·20	90·57	90·95	91·32
·03	91·70	92·08	92·47	92·85	93·24	93·62	94·00	94·38	94·77	95·15
·04	95·54	95·92	96·31	96·70	97·09	97·48	97·86	98·25	98·64	99·04
·05	99·44	99·84	100·25	100·65	101·06	101·46	101·86	102·26	102·67	103·07
·06	103·48	103·89	104·30	104·72	105·13	105·55	105·95	106·36	106·77	107·19
·07	107·61	108·04	108·47	108·90	109·33	109·76	110·18	110·61	111·04	111·48
·08	111·92	112·36	112·80	113·24	113·69	114·13	114·57	115·03	115·50	115·97
·09	116·44	116·91	117·38	117·85	118·32	118·81	119·29	119·78	120·27	120·76
·10	121·25	121·75	122·25	122·76	123·28	123·80	124·31	124·83	125·35	125·87
·11	126·43	126·99	127·55	128·11	128·67	129·23	129·78	130·34	130·90	131·46
·12	132·02	132·58	133·14	133·83	134·52	135·21	135·89	136·59	137·29	138·00
·13	138·71	139·42	140·13	140·84	141·55	142·41	143·27	144·14	145·01	145·93
·14	146·85	147·77	148·70	149·80	150·90	152·00	153·05	154·52	155·94	157·36
·150	158·83	159·04	159·25	159·46	159·67	159·88	160·09	160·30	160·53	160·77
·151	161·01	161·24	161·47	161·71	161·95	162·19	162·43	162·67	162·91	163·15
·152	163·39	163·62	163·86	164·10	164·48	164·86	165·24	165·62	166·00	166·38
·153	166·77	167·15	167·53	167·91	169·17	170·44	171·71	...	...	...

Eqn. +	9	8	7	6	5	4	3	2	1	0
·153	...	...	...	171·71	172·98	174·25	175·51	175·89	176·27	176·65
·152	177·04	177·42	177·80	178·18	178·56	178·94	179·32	179·56	179·80	180·03
·151	180·27	180·51	180·75	180·99	181·23	181·47	181·71	181·95	182·18	182·41
·150	182·65	182·89	183·12	183·33	183·54	183·75	183·96	184·17	184·38	184·59
·14	186·06	187·48	188·90	190·32	191·44	192·54	193·64	194·74	195·67	196·59
·13	197·51	198·43	199·30	200·17	201·05	201·91	202·62	203·33	204·04	204·75
·12	205·46	206·17	206·87	207·57	208·27	208·96	209·65	210·34	210·90	211·46
·11	212·02	212·58	213·14	213·70	214·27	214·83	215·39	215·95	216·51	217·07
·10	217·63	218·15	218·67	219·19	219·72	220·24	220·76	221·27	221·77	222·27
·09	222·76	223·25	223·74	224·23	224·73	225·22	225·69	226·16	226·63	227·10
·08	227·57	228·04	228·51	228·97	229·43	229·87	230·32	230·76	231·20	231·64
·07	232·08	232·52	232·95	233·38	233·82	234·25	234·78	235·21	235·64	236·07
·06	236·39	236·81	237·22	237·63	238·05	238·47	238·88	239·30	239·71	240·12
·05	240·53	240·93	241·34	241·74	242·16	242·56	242·97	243·37	243·78	244·18
·04	244·58	244·98	245·37	245·76	246·16	246·55	246·94	247·33	247·72	248·10
·03	248·49	248·87	249·26	249·64	250·04	250·42	250·81	251·19	251·58	251·96
·02	252·34	252·71	253·09	253·46	253·85	254·22	254·60	254·97	255·35	255·72
·01	256·09	256·47	256·84	257·22	257·60	257·98	258·35	258·73	259·10	259·47
·00	259·84	260·21	260·58	260·95	261·33	261·70	262·07	262·44	262·81	263·18

Eqn. −	0	1	2	3	4	5	6	7	8	9
·00	263·18	263·54	263·91	264·28	264·65	265·02	265·40	265·77	266·14	266·51
·01	266·88	267·25	267·62	268·00	268·37	268·75	269·13	269·51	269·88	270·26
·02	270·63	271·00	271·38	271·75	272·13	272·50	272·89	273·26	273·64	274·01
·03	274·39	274·77	275·16	275·54	275·93	276·31	276·71	277·09	277·48	277·86
·04	278·25	278·63	279·02	279·41	279·80	280·19	280·59	280·98	281·37	281·77
·05	282·17	282·57	282·98	283·38	283·79	284·19	284·61	285·01	285·42	285·82
·06	286·23	286·64	287·05	287·49	287·88	288·30	288·72	289·13	289·54	289·96
·07	290·38	290·81	291·24	291·67	292·10	292·53	292·97	293·40	293·83	294·27
·08	294·71	295·15	295·59	296·03	296·48	296·92	297·38	297·84	298·31	298·78
·09	299·25	299·72	300·19	300·66	301·13	301·62	302·12	302·61	303·10	303·59
·10	304·08	304·58	305·08	305·59	306·11	306·63	307·16	307·68	308·20	308·72
·11	309·28	309·84	310·40	310·96	311·52	312·08	312·65	313·21	313·77	314·33
·12	314·89	315·45	316·01	316·70	317·39	318·08	318·78	319·48	320·18	320·89
·13	321·60	322·31	323·02	323·73	324·44	325·30	326·18	327·05	327·92	328·84
·14	329·76	330·68	331·61	332·71	333·81	334·91	336·03	337·45	338·87	340·29
·150	341·76	341·97	342·18	342·39	342·60	342·81	343·02	343·23	343·46	343·70
·151	343·94	344·17	344·40	344·64	344·88	345·12	345·36	345·60	345·84	346·08
·152	346·32	346·55	346·79	347·03	347·41	347·79	348·17	348·55	348·93	349·31
·153	349·70	350·08	350·46	350·84	352·10	353·37	354·64	...	...	...

Eqn. −	9	8	7	6	5	4	3	2	1	0
·153	...	...	...	...	355·91	357·18	358·44	358·82	359·20	359·58
·152	359·97	360·35	360·73	361·11	361·49	361·87	362·25	362·49	362·73	362·96
·151	363·20	363·44	363·68	363·92	364·16	364·40	364·64	364·88	365·11	...

e—EYE-TABLE FOR TITHIS.

Moon's anomaly and equation of the centre expressed in days and fractions of a day.

(ĀRYA SIDDHĀNTA.)

Eqn.	0	1	2	3	4	5	6	7	8	9
—	Moon's anomaly in days.									
·00	0·000	0·011	0·023	0·035	0·046	0·058	0·070	0·081	0·092	0·104
·01	0·116	0·127	0·139	0·151	0·162	0·174	0·186	0·197	0·209	0·221
·02	0·232	0·244	0·256	0·267	0·279	0·291	0·303	0·315	0·327	0·339
·03	0·350	0·362	0·374	0·385	0·397	0·409	0·420	0·432	0·444	0·456
·04	0·468	0·479	0·491	0·503	0·514	0·526	0·538	0·549	0·561	0·573
·05	0·584	0·596	0·608	0·619	0·631	0·642	0·654	0·666	0·678	0·689
·06	0·701	0·713	0·725	0·736	0·748	0·760	0·772	0·783	0·795	0·807
·07	0·819	0·830	0·842	0·854	0·866	0·878	0·890	0·902	0·914	0·926
·08	0·938	0·950	0·962	0·973	0·985	0·997	1·009	1·021	1·033	1·045
·09	1·057	1·069	1·081	1·093	1·105	1·117	1·129	1·141	1·153	1·165
·10	1·177	1·189	1·201	1·213	1·225	1·237	1·249	1·261	1·273	1·285
·11	1·297	1·309	1·322	1·334	1·346	1·358	1·370	1·382	1·395	1·407
·12	1·419	1·431	1·443	1·455	1·467	1·479	1·491	1·503	1·515	1·527
·13	1·539	1·552	1·565	1·578	1·590	1·603	1·615	1·628	1·640	1·653
·14	1·665	1·678	1·690	1·703	1·715	1·728	1·740	1·753	1·765	1·778
·15	1·790	1·803	1·815	1·827	1·839	1·851	1·863	1·876	1·889	1·901
·16	1·914	1·926	1·939	1·952	1·964	1·977	1·989	2·002	2·015	2·027
·17	2·040	2·052	2·065	2·578	2·090	2·103	2·115	2·128	2·141	2·154
·18	2·167	2·180	2·193	2·206	2·219	2·232	2·245	2·258	2·271	2·284
·19	2·297	2·310	2·323	2·336	2·349	2·362	2·375	2·388	2·401	2·414
·20	2·427	2·440	2·453	2·466	2·479	2·493	2·507	2·521	2·534	2·548
·21	2·561	2·575	2·588	2·602	2·615	2·629	2·642	2·656	2·669	2·683
·22	2·696	2·710	2·723	2·737	2·750	2·764	2·777	2·791	2·804	2·818
·23	2·832	2·846	2·860	2·874	2·888	2·902	2·916	2·930	2·944	2·958
·24	2·972	2·986	3·000	3·014	3·028	3·042	3·056	3·071	3·086	3·100
·25	3·115	3·130	3·144	3·159	3·173	3·188	3·202	3·217	3·231	2·246
·26	3·261	3·276	3·291	3·306	3·321	3·336	3·351	3·366	3·381	3·395
·27	3·410	3·425	3·441	3·456	3·472	3·487	3·503	3·518	3·534	3·549
·28	3·565	3·580	3·595	3·611	3·626	3·642	3·658	3·674	3·690	3·706
·29	3·722	3·738	3·755	3·771	3·788	3·804	3·821	3·837	3·854	3·870
·30	3·886	3·902	3·919	3·935	3·952	3·969	3·986	4·003	4·020	4·037
·31	4·054	4·072	4·090	4·107	4·125	4·143	4·160	4·178	4·196	4·213
·32	4·231	4·249	4·266	4·284	4·302	4·319	4·337	4·356	4·375	4·394
·33	4·413	4·432	4·451	4·470	4·489	4·508	4·527	4·546	4·565	4·584
·34	4·603	4·623	4·643	4·664	4·685	4·706	4·727	4·748	4·769	4·790
·35	4·811	4·832	4·853	4·874	4·896	4·918	4·940	4·963	4·986	5·009
·36	5·032	5·055	5·078	5·101	5·124	5·147	5·170	5·193	5·217	5·241
·37	5·268	5·295	5·322	5·349	5·376	5·403	5·430	5·457	5·484	5·511
·38	5·537	5·568	5·599	5·630	5·661	5·692	5·723	5·754	5·785	5·816
·39	5·847	5·885	5·923	5·961	5·999	6·037	6·075	6·113	6·151	6·189
·400	6·277	6·232	6·237	6·242	6·247	6·253	6·258	6·263	6·268	6·273
·401	6·278	6·283	6·288	6·293	6·298	6·304	6·309	6·314	6·319	6·324
·402	6 330	6·335	6·341	6·346	6 352	6·358	6·364	6·369	6·375	6·380
·403	6·386	6 391	6·397	6·402	6·408	6·414	6·420	6·425	6·431	6·437
·404	6·444	6·450	6·457	6·464	6·470	6·477	6·484	6·490	6·497	6 504
·405	6·511	6·517	6·524	6·530	6·537	6·544	6·551	6·557	6·564	6·570
·406	6·577	6·583	6·589	6·596	6·602	6·610	6·616	6·623	6·630	6·636
·407	6·643	6·649	6·656	6·662	6·669	6·676	6·683	6·689	6·696	6·702
·408	6·709	6·715	6·722	6·733	6·745	6·757	6·769	6·780	6·792	6·803
·409	6·815	6·826	6·838	6·850	6·861	6·874	6·885	6·897	6·908	6·920
·410	6·931	6·943	6·954	6·966	6·977	6·990	7·001	7·013	7·041	7·069
·411	7·097	7·126	7·155	7·184	7·213	7·243	7·272	7·301	...	...

Eqn.	9	8	7	6	5	4	3	2	1	0
—	Moon's anomaly in days.									
·411	...	...	7·301	7·330	7·359	7·387	7·416	7·445	7·474	7·503
·410	7·531	7·559	7·587	7·598	7·609	7·620	7·631	7·643	7·654	7·666
·409	7·677	7·689	7·700	7·712	7·723	7·734	7·745	7·757	7·769	7·780
·408	7·792	7·803	7·815	7·826	7·838	7·848	7·860	7·871	7·878	7·884
·407	7·891	7·897	7·904	7·910	7·917	7·922	7 929	7·935	7·942	7 948
·406	7·955	7·961	7·968	7·975	7·981	7·987	7·993	8·000	8·006	8·012
·405	8·019	8·025	8·032	8·038	8·045	8·050	8·057	8·063	8·070	8·076
·404	8·083	8·090	8·097	8·103	8·110	8·115	8·121	8·128	8·135	8·141
·403	8·148	8·154	8·160	8·165	8·171	8·175	8·181	8·186	8·192	8·197
·402	8·203	8·208	8·214	8·219	8·225	8·229	8·235	8·240	8·246	8·251
·401	8·257	8·262	8·267	8·272	8·277	8·281	8·286	8·291	8·296	8·301
·400	8·306	8·311	8·316	8·321	8·326	8·330	8·335	8·340	8·344	8·349
·39	8·385	8·421	8·457	8·493	8·529	8·565	8·601	8·637	8·672	8·708
·38	8·737	8·768	8·799	8·828	8·857	8·886	8·915	8·944	8·972	9·000
·37	9·025	9·050	9·075	9·100	9·125	9·150	9·175	9·200	9·225	9·250
·36	9·274	9·296	9·318	9·339	9 360	9·381	9·402	9·423	9·444	9·465
·35	9·486	9·507	9·528	9·549	9·569	9·589	9 609	9·628	9·647	9·666
·34	9·685	9·704	9·723	9·742	9·761	9·780	9·799	9·818	9·836	9·854
·33	9·871	9·888	9·905	9·922	9·939	9·956	9·973	9·990	10·007	10·024
·32	10·041	10·058	10·075	10·092	10·108	10 123	10·139	10·155	10·170	10·186
·31	10·202	10·217	10·233	10·249	10·264	10·280	10·296	10·311	10·327	10·343
·30	10·358	10·373	10·388	10·403	10·418	10·433	10·448	10·462	10·477	10·491
·29	10·505	10·519	10·534	10·548	10·563	10·577	10·592	10·606	10·621	10·635
·28	10·649	10·663	10·677	10·691	10·705	10·719	10·732	10·746	10·759	10·773
·27	10·787	10·800	10·814	10·827	10·841	10·854	10·868	10·881	10·894	10·907
·26	10·920	10·932	10·945	10·958	10·971	10·984	10·997	11·010	11·023	11·036
·25	11·049	11·062	11·074	11·087	11·099	11·112	11·124	11·137	11·149	11·162
·24	11·175	11·187	11·200	11·213	11·225	11·237	11·249	11·261	11·273	11·285
·23	11·297	11·309	11·321	11·333	11·345	11·357	11·369	11·381	11·393	11·405
·22	11·417	11·429	11·440	11·452	11·463	11·475	11·486	11·498	11·509	11·521
·21	11·532	11·544	11·555	11·567	11·578	11·591	11·601	11·613	11·624	11·636
·20	11·647	11·659	11·670	11·682	11·694	11·705	11·717	11·728	11·739	11·750
·19	11·761	11·772	11·783	11·794	11·805	11·816	11·827	11·838	11·849	11·860
·18	11·871	11·882	11·893	11·904	11·915	11·926	11·937	11·948	11·959	11·970
·17	11·981	11·992	12·003	12·014	12·024	12·035	12·045	12·056	12·067	12·077
·16	12·088	12·098	12·109	12·120	12·130	12·141	12·151	12·162	12·173	12·183
·15	12·194	12·204	12·215	12·226	12·236	12·246	12·256	12·266	12·276	12·287
·14	12·297	12·308	12·318	12·329	12·339	12·350	12 360	12·371	12·381	12·392
·13	12·402	12·413	12·423	12·434	12·444	12·455	12·465	12 476	12·487	12·498
·12	12·508	12·518	12 528	12·538	12·548	12·558	12·568	12·578	12·588	12 598
·11	12·608	12·618	12·629	12·639	12·649	12·659	12·669	12·679	12·690	12·700
·10	12 710	12·720	12 730	12·740	12·750	12·760	12·770	12·780	12·790	12·800
·09	12·810	12 820	12·830	12·840	12·850	12·860	12·870	12·880	12·890	12·900
·08	12 910	12·920	12·930	12·940	12·950	12·960	12·970	12·979	12 989	12·999
·07	13·009	13 019	13·029	13·039	13·049	13·059	13·069	13·079	13·089	13·098
·06	13·108	13·118	13·127	13·137	13·147	13·157	13·166	13·176	13·186	13·196
·05	13·205	13 215	13·225	13·235	13·245	13·254	13·264	13·273	13·283	13·293
·04	13·302	13·312	13·322	13 331	13·341	13·351	13·360	13·370	13·380	13·389
·03	13·399	13·409	13·419	13·429	13·438	13·448	13·458	13·467	13·477	13·487
·02	13·496	13·506	13·516	13·525	13·535	13·545	13·555	13·565	13·575	13·585
·01	13·594	13·604	13·614	13·623	13·633	13·643	13·652	13·662	13·672	13·681
·00	13·691	13·701	13·710	13·719	13·729	13·739	13·748	13·758	13·768	13·777

e—EYE-TABLE FOR TITHIS—*continued*.

Moon's anomaly and equation of the centre expressed in days and fractions of a day.

(ĀRYA SIDDHĀNTA.)

Eqn. +	0	1	2	3	4	5	6	7	8	9
	Moon's anomaly in days.									
·00	13·777	13·786	13·796	13·806	13·815	13·825	13·835	13·844	13·853	13·863
·01	13·873	13·882	13·892	13·902	13·911	13·921	13·931	13·940	13·950	13·960
·02	13·969	13·979	13·989	13·998	14·008	14·018	14·028	14·038	14·048	14·058
·03	14·067	14·077	14·087	14·096	14·106	14·116	14·125	14·135	14·145	14·155
·04	14·165	14·174	14·184	14·194	14·203	14·213	14·223	14·232	14·242	14·252
·05	14·261	14·271	14·281	14·290	14·300	14·309	14·319	14·329	14·339	14·348
·06	14·358	14·368	14·378	14·387	14·397	14·407	14·417	14·426	14·436	14·446
·07	14·456	14·465	14·475	14·485	14·495	14·505	14·515	14·525	14·535	14·545
·08	14·555	14·565	14·575	14·584	14·594	14·604	14·614	14·624	14·634	14·644
·09	14·654	14·664	14·674	14·684	14·694	14·704	14·714	14·724	14·734	14·744
·10	14·754	14·764	14·774	14·784	14·794	14·804	14·814	14·824	14·834	14·844
·11	14·854	14·864	14·875	14·885	14·895	14·905	14·915	14·925	14·936	14·946
·12	14·956	14·966	14·976	14·986	14·996	15·006	15·016	15·026	15·036	15·046
·13	15·056	15·067	15·078	15·089	15 099	15·110	15·120	15·131	15·141	15·152
·14	15·162	15·173	15·183	15·194	15·204	15·215	15·225	15·236	15·246	15·257
·15	15·267	15·278	15·288	15·298	15·308	15·318	15·328	15·339	15·350	15·360
·16	15·371	15·381	15·392	15·403	15·413	15·424	15·434	15·445	15·456	15·466
·17	15·477	15·487	15·498	15·509	15·519	15·530	15·540	15·551	15·562	15·573
·18	15·584	15·595	15·606	15·617	15·628	15·639	15·650	15·661	15·672	15·683
·19	15·694	15·705	15·716	15·727	15·738	15·749	15 760	15·771	15·782	15·793
·20	15·804	15·815	15·826	15·837	15·848	15·860	15·872	15·884	15·895	15·907
·21	15·918	15·930	15·941	15·953	15·964	15·976	15·987	15·999	16·010	16·022
·22	16·033	16·045	16·056	16·068	16·079	16·091	16 102	16·114	16·125	16·137
·23	16·149	16·161	16·173	16·185	16 197	16 209	16·221	16·233	16·245	16·257
·24	16·269	16·281	16·293	16·305	16·317	16·329	16·341	16·354	16·367	16·379
·25	16·392	16·405	16·417	16·430	16·442	16·455	16·467	16·480	16·492	16·505
·26	16·518	16·531	16·544	16·557	16·570	16·583	16·596	16·609	16·622	16·634
·27	16·647	16·660	16·674	16·687	16·701	16·714	16·728	16·741	16·755	16·768
·28	16·782	16·795	16·808	16·822	16·836	16·850	16·864	16·878	16·892	16·906
·29	16·920	16·934	16·949	16·963	16·978	16·992	17·007	17·021	17·036	17·050
·30	17·064	17·078	17·093	17·107	17·122	17·137	17·152	17·167	17·182	17·197
·31	17·212	17·228	17·244	17·259	17·275	17·291	17·306	17·322	17·338	17·353
·32	17·369	17·385	17·400	17·416	17·432	17·447	17·463	17·480	17·497	17·514
·33	17·531	17·548	17·565	17·582	17·599	17·616	17·633	17 650	17·667	17·684
·34	17·701	17·719	17·737	17·756	17·775	17·794	17·813	17·832	17·851	17·870
·35	17·889	17·908	17·927	17·946	17·966	17.986	18·006	18·027	18·048	18·069
·36	18·090	18·111	18·132	18·153	18·174	18.195	18·216	18·237	18·259	18·281
·37	18·306	18·331	18·356	18·381	18·406	18.431	18·456	18·481	18·506	18·530
·38	18·554	18·582	18·610	18·639	18·668	18·697	18 726	18·755	18·786	18·817
·39	18·845	18·881	18·917	18·953	18·989	19.025	19·061	19·097	19·134	19·170
·400	19·206	19·211	19·216	19·221	19·226	19·230	19·235	19·240	19·245	19·250
·401	19·255	19·260	19·265	19·270	19·275	19·279	19·284	19·289	19·294	19·299
·402	19·305	19·310	19·316	19·321	19·327	19·331	19·337	19·342	19·348	19 353
·403	19·358	19·363	19·369	19 374	19·380	19·384	19·390	19·395	19·401	19·407
·404	19·414	19·420	19·427	19·434	19·440	19·445	19·452	19·458	19·465	19·472
·405	19·479	19·485	19·492	19 498	19·505	19·510	19·517	19·523	19·530	19·536
·406	19·543	19·549	19·555	19·562	19·568	19·574	19·580	19·587	19·594	19·600
·407	19·607	19·613	19·620	19 626	19·633	19·638	19·645	19·651	19·658	19·664
·408	19·671	19·677	19·684	19·695	19·707	19·717	19·729	19·740	19·752	19 763
·409	19·775	19·786	19·798	19·810	19·821	19·832	19·843	19·855	19·866	19·878
·410	19·889	19·901	19·912	19·924	19·935	19·946	19·957	19·968	19·996	20·024
·411	20·052	20·081	20·110	20·139	20·168	20·196	20·225	20·254	...	...

Eqn. +	9	8	7	6	5	4	3	2	1	0
	Moon's anomaly in days.									
·411	...	...	20·254	20·283	20·312	20·342	20·371	20·400	20·429	20·458
·410	20·486	20·514	20·542	20·553	20·564	20·577	20·588	20·600	20·611	20·623
·409	20·634	20·646	20·657	20·669	20·680	20·693	20·704	20·716	20·728	20·739
·408	20·751	20·762	20·774	20·785	20·797	20·809	20·821	20·832	20·839	20·845
·407	20·852	20·858	20·865	20·871	20·878	20·885	20·892	20·898	20·905	20·911
·406	20·918	20·924	20·931	20·938	20·944	20·952	20·958	20 965	20·971	20·977
·405	20·984	20·990	20·997	21·003	21·010	21·017	21·024	21·030	21·037	21·043
·404	21·050	21·057	21·064	21·070	21·077	21 084	21·090	21·097	21·104	21·110
·403	21·117	21·123	21·129	21·134	21·140	21·146	21·152	21·157	21·163	21·168
·402	21·173	21·178	21·184	21·189	21·195	21·201	21·207	21·212	21·218	21·223
·401	21·229	21·234	21·239	21·244	21·249	21·255	21·260	21·265	21·270	21·275
·400	21·280	21·285	21·290	21·295	21·300	21·306	21·311	21·316	21·321	21·326
·39	21·364	21·402	21·440	21·478	21·516	21·554	21·592	21·630	21·668	21·707
·38	21·738	21·770	21·803	21·834	21·865	21·896	21·927	21·958	21·988	22·018
·37	22·044	22·070	22·097	22·124	22·151	22·178	22·207	22·234	22·261	22·287
·36	22·313	22·337	22·361	22·384	22·407	22·430	22·453	22·476	22·499	22·522
·35	22·545	22·568	22 591	22·614	22·636	22 658	22·680	22·701	22·722	22·743
·34	22·764	22·785	22·806	22·827	22·848	22·869	22·890	22·911	22·931	22 951
·33	22·970	22·989	23·008	23·027	23·046	23·065	23·084	23·103	23·122	23·141
·32	23·160	23·179	23·198	23·217	23·235	23·252	23·270	23·288	23·305	23·327
·31	23·341	23·358	23·376	23·394	23·411	23·429	23·447	25·464	23·482	23·500
·30	23·517	23·534	23·551	23·568	23·585	23·602	23·619	23·635	23·652	23·668
·29	23·684	23·700	23·717	23·733	23·750	23·766	23·783	23·799	23·816	23·832
·28	23·848	23·864	23·880	23·896	23·912	23·928	23·944	23·960	23·975	23·990
·27	24·006	24·021	24·037	24·052	24·068	24·083	24·099	24·114	24·129	24·144
·26	24·159	24·173	24·188	24·203	24·218	24·233	24·248	24·263	24·278	24·293
·25	24·308	24·323	24·338	24·353	24·367	24·382	24·396	24·411	24·425	24·440
·24	24·454	24·468	24·483	24·498	24·512	24·526	24·540	24·554	24·568	24·582
·23	24·596	24·610	24·624	24·638	24·652	24·666	24·680	24·694	24·708	24·722
·22	24·736	24·750	24·763	24·777	24·790	24·804	24·817	24·831	24·844	24·858
·21	24 871	24·885	24·898	24·912	24·925	24·939	24·952	24·966	24·979	24·993
·20	25·006	25·020	25·033	25·047	25·061	25·075	25·088	25·101	25·114	25·127
·19	25·140	25·153	25·166	25·179	25·192	25·205	25·218	25·231	25·244	25·257
·18	25·270	25·283	25·296	25·309	25·322	25·335	25·348	25·361	25·374	25·387
·17	25·400	25·413	25·426	25·439	25·451	25·464	25·476	25·489	25·502	25·514
·16	25·527	25·539	25·552	25·565	25·577	25·590	25·602	25·615	25 628	25·640
·15	25·653	25·665	25·678	25 691	25·703	25·715	25·727	25·739	25·751	25·764
·14	25·776	25·789	25·801	25·814	25·826	25·839	25·851	25·864	25·876	25·889
·13	25·901	25·914	25·926	25·939	25·951	25·964	25·976	25·989	26·002	26·015
·12	26·027	26·039	26·051	26·063	26·075	26·087	26·099	26·111	26·123	26·135
·11	26·147	26·159	26·171	26·183	26·196	26·208	26·220	26·232	26·245	26·257
·10	26·269	26·281	26·293	26·305	26·317	26·329	26·341	26·353	26·365	26 377
·09	26·389	26·401	26 413	26·425	26·437	26·449	26·461	26 473	26·485	26·497
08	26·509	26·521	26·533	26·545	26·557	26·569	26·581	26·592	26·604	26·616
·07	26·628	26·640	26·652	26·664	26·676	26·688	26·700	26·712	26·724	26·735
·06	26·747	26·759	26·771	26·782	26·794	26·806	26·818	26·829	26·841	26 853
·05	26·865	26·876	26·888	26·900	26·912	26·923	26·935	26·946	26·958	26·970
·04	26·981	26·993	27·005	27·016	27·028	27·040	27 051	27·063	27·075	27·086
·03	27·098	27·110	27·122	27·134	27·145	27·157	27·169	27·180	27·192	27·204
·02	27·215	27·227	27·239	27·251	27·263	27·275	27·287	27·298	27·310	27·322
·01	27·333	27·345	27·357	27·368	27 380	27·392	27·403	27·415	27·427	27·438
·00	27·450	27·462	27·473	27·484	27·496	27·508	27·519	27·531	27·543	27·555

f—EYE-TABLE FOR NAKSHATRAS.

Moon's anomaly and moon's equation of the centre in days and fractions of a day.

(ĀRYA SIDDHĀNTA.)

Eqn.	0	1	2	3	4	5	6	7	8	9	Eqn.	9	8	7	6	5	4	3	2	1	0
—	Moon's anomaly in days.										—	Moon's anomaly in days.									
·00	0·000	0·012	0·024	0·036	0·049	0·061	0·074	0·086	0·099	0·111	·380	7·271	7·304	7·343	7·360	7·401	7·429	7·472	7·500	7·528	7·551
·01	0·124	0·136	0·149	0·161	0·174	0·186	0·199	0·211	0·224	0·236	·379	7·563	7·576	7·589	7·602	7·614	7·625	7·638	7·651	7·664	7·677
·02	0·249	0·261	0·274	0·287	0·299	0·312	0·325	0·337	0·350	0·363	·378	7·689	7·701	7·713	7·725	7·738	7·750	7·763	7·776	7·789	7·801
·03	0·376	0·389	0·401	0·414	0·427	0·439	0·452	0·464	0·477	0·489	·377	7·815	7·830	7·839	7·846	7·853	7·859	7·866	7·874	7·881	7·888
·04	0·502	0·514	0·527	0·539	0·552	0·564	0·577	0·589	0·602	0·614	·376	7·896	7·903	7·910	7·917	7·924	7·930	7·937	7·944	7·951	7·958
·05	0·627	0·639	0·652	0·664	0·677	0·689	0·702	0·714	0·727	0·739	·375	7·965	7·972	7·979	7·986	7·992	7·998	8·005	8·012	8·019	8·026
·06	0·752	0·764	0·777	0·789	0·802	0·815	0·828	0·841	0·854	0·867	·374	8·033	8·041	8·049	8·057	8·064	8·070	8·077	8·084	8·091	8·098
·07	0·880	0·893	0·905	0·917	0·930	0·943	0·956	0·969	0·982	0·995	·373	8·105	8·112	8·118	8·124	8·130	8·135	8·141	8·147	8·153	8·159
·08	1·008	1·020	1·033	1·046	1·059	1·072	1·085	1·098	1·111	1·124	·372	8·165	8·171	8·177	8·183	8·188	8·194	8·199	8·205	8·212	8·217
·09	1·137	1·150	1·162	1·175	1·188	1·201	1·214	1·227	1·240	1·253	·371	8·223	8·229	8·235	8·240	8·245	8·250	8·256	8·261	8·266	8·271
·10	1·266	1·279	1·292	1·305	1·318	1·331	1·344	1·357	1·370	1·383	·370	8·277	8·282	8·288	8·294	8·300	8·305	8·310	8·315	8·320	8·324
·11	1·396	1·409	1·422	1·435	1·448	1·461	1·474	1·487	1·500	1.513	·36	8·363	8·402	8·441	8·479	8·517	8·555	8·593	8·631	8·669	8·707
·12	1·527	1·540	1·553	1·566	1·580	1·593	1·606	1·619	1·633	1·646	·35	8·737	8·768	8·799	8·830	8·861	8·891	8·922	8·952	8·983	9·013
·13	1·660	1·673	1·687	1·700	1·714	1·727	1·741	1·754	1·768	1·781	·34	9·039	9·066	9·093	9·120	9·146	9·173	9·200	9·226	9·253	9·280
·14	1·795	1·808	1·821	1·835	1·848	1·861	1·875	1·888	1·901	1·914	·33	9·303	9·326	9·349	9·372	9·395	9·418	9·441	9·464	9·486	9·508
·15	1·928	1·942	1·955	1·969	1·982	1·996	2·009	2·022	2·036	2·050	·32	9·529	9·550	9·571	9·592	9·613	9·634	9·655	9·676	9·697	9·718
·16	2·064	2·078	2·092	2·105	2·119	2·133	2·146	2·160	2·174	2·187	·31	9·739	9·758	9·777	9·796	9·815	9·834	9·854	9·873	9·893	9·912
·17	2·201	2·215	2·229	2·243	2·257	2·271	2·285	2·299	2·313	2·327	·30	9·929	9·947	9·965	9·984	10·002	10·021	10·039	10·058	10·076	10·095
·18	2·341	2·355	2·369	2·383	2·397	2·411	2·425	2·439	2·454	2·468	·29	10·113	10·130	10·147	10·164	10·181	10·198	10·215	10·232	10·249	10·266
·19	2·483	2·497	2·512	2·526	2·541	2·555	2·570	2·584	2·599	2·614	·28	10·283	10·299	10·306	10·322	10·339	10·355	10·372	10·388	10·405	10·431
·20	2·629	2·643	2·658	2·672	2·687	2·701	2·716	2·730	2·744	2·759	·27	10·447	10·462	10·478	10·494	10·509	10·525	10·541	10·556	10·572	10·588
·21	2·774	2·789	2·804	2·819	2·834	2·848	2·863	2·878	2·893	2·907	·26	10·603	10·618	10·633	10·648	10·663	10·678	10·693	10·708	10·723	10·738
·22	2·922	2·937	2·953	2·968	2·984	2·999	3·015	3·030	3·046	3·061	·25	10·753	10·768	10·783	10·797	10·812	10·826	10·841	10·855	10·870	10·884
·23	3·076	3·092	3·108	3·123	3·139	3·155	3·170	3·186	3·202	3·217	·24	10·898	10·912	10·926	10·940	10·954	10·968	10·982	10·996	11·010	11·024
·24	3·233	3·249	3·265	3·281	3·297	3·313	3·329	3·345	3·361	3·377	·23	10·088	11·051	11·065	11·079	11·092	11·106	11·120	11·133	11·147	11·161
·25	3·393	3·409	3·426	3·442	3·459	3·475	3·492	3·508	3·525	3·542	·22	11·174	11·187	11·201	11·214	11·228	11·241	11·255	11·268	11 282	11·295
·26	3·559	3·576	3 593	3·610	3·627	3·644	3·661	3·678	3·695	3·712	·21	11·308	11·320	11·333	11·346	11·359	11·371	11·384	11·397	11·410	11·423
·27	3·729	3·747	3·765	3·782	3·800	3·818	3·835	3·853	3·871	3·888	·20	11·436	11·449	11·461	11·473	11·486	11·498	11·511	11·523	11·536	11 548
·28	3 906	3·924	3·943	3·961	3·980	3·998	4·017	4·035	4·054	4·072	·19	11·561	11·574	11·587	11·599	11·612	11·624	11·637	11·649	11·662	11·674
·29	4·091	4·110	4·129	4·148	4·167	4·186	4·205	4·224	4·243	4·262	·18	11·687	11·699	11·712	11·724	11·736	11·748	11·760	11·772	11·784	11·796
·30	4·282	4·303	4·328	4·344	4·364	4·385	4·405	4·426	4·446	4·466	·17	11·808	11·820	11·832	11·844	11·856	11·868	11·880	11·892	11·904	11·916
·31	4·486	4·506	4·528	4·549	4·571	4·592	4·613	4·634	4·655	4·676	·16	11·928	11·939	11·951	11·963	11·974	11·986	11·998	12·009	12·021	12·033
·32	4·699	4·722	4·745	4·768	4·791	4·814	4·837	4·860	4·883	4·906	·15	12·045	12·057	12·069	12 080	12·091	12·103	12·114	12·126	12·137	12·149
·33	4·929	4·953	4·977	5·002	5·027	5·052	5·077	5·102	5·126	5·152	·14	12·161	12·172	12·183	12·194	12·206	12·217	12·228	12·240	12·251	12·262
·34	5·177	5·206	5·235	5·263	5·292	5·321	5·349	5·378	5·407	5·436	·13	12·274	12·285	12·297	12·308	12·320	12·331	12·343	12·354	12·366	12·377
·35	5·464	5·496	5·529	5·561	5·594	5·626	5·659	5·692	5·725	5·750	·12	12·389	12·400	12·412	12·423	12·434	12·445	12·457	12·468	12·479	12·490
·36	5·790	5·830	5·870	5·910	5·950	5·990	6·030	6·070	6·111	6·152	·11	12·502	12·513	12·524	12·535	12·546	12·557	12·568	12·579	12·590	12·601
·370	6·193	6·197	6·202	6·207	6·212	6·219	6·225	6·231	6·237	6·242	·10	12·612	12·623	12·634	12·645	12·656	12·667	12·678	12·689	12·700	12·711
·371	6·248	6·253	6·258	6·263	6·269	6 276	6·281	6 286	6·292	6·298	·09	12·722	12·733	12·744	12·755	12·766	12·777	12·788	12·799	12·809	12·820
·372	6·304	6·309	6·316	6·322	6·328	6·334	6 340	6·346	6·352	6·358	·08	12·831	12·842	12·853	12·864	12·875	12·886	12·897	12·908	12·919	12·929
·373	6·364	6·370	6·376	6·382	6·388	6 395	6·401	6·407	6·413	6·420	·07	12·940	12·951	12·962	12·973	12·984	12·995	13·006	13·016	13 026	13·037
·374	6·427	6·434	6·441	6·448	6·455	6·463	6·470	6·478	6·486	6·494	·06	13·048	13·059	13·070	13·081	13·092	13·103	13·114	13·124	13·135	13·145
·375	6·501	6·508	6·515	6·522	6 529	6·537	6·543	6·550	6·557	6·564	·05	13·156	13·166	13·177	13·187	13·198	13·208	13·219	13·229	13·240	13·250
·376	6·571	6·578	6·585	6·592	6·599	6·607	6·614	6·621	6 628	6·635	·04	13·261	13·271	13 282	13·292	13·303	13·313	13·324	13·334	13·345	13·355
·377	6·643	6·650	6·657	6·665	6·672	6·680	6·686	6·694	6·703	6·718	·03	13·366	13 376	13·387	13·397	13·408	13·418	13·429	13·440	13·450	13·461
·378	6·732	6·744	6·757	6·770	6·783	6·797	6·810	6·822	6·834	6·846	·02	13·472	13·483	13·494	13·504	13·515	13·526	13·536	13·547	13·558	13·568
·379	6·858	6·871	6·884	6·897	6·910	6·923	6·935	6·948	6·961	6·974	·01	13·579	13·589	13·600	13·610	13·621	13·631	13·642	13·652	13 663	13·673
·380	6·986	7·010	7·038	7·066	7·109	7·139	7·180	7·197	7·236	7·269	·00	13·684	13·694	13·705	13·715	13·726	13·736	13·747	13·757	13·767	13·777

f—EYE-TABLE FOR NAKSHATRAS—*continued.*

Moon's anomaly and moon's equation of the centre in days and fractions of a day.

(ĀRYA SIDDHĀNTA.)

Eqn. +	0	1	2	3	4	5	6	7	8	9	Eqn. +	9	8	7	6	5	4	3	2	1	0
	Moon's anomaly in days.											Moon's anomaly in days.									
·00											·380	20·285	20·308	20·357	20·371	20·411	20·445	20·488	20·516	20·544	20·568
·01	...	13·891	13·902	13·912	13·923	13·933	13·944	13·954	13·965	13·975	·379	20·580	20·593	20·606	20·619	20·631	20·644	20·657	20·670	20·683	20·696
·02	13·986	13·996	14·007	14·018	14·028	14·039	14·050	14·060	14·071	14·082	·378	20·708	20·720	20·732	20·744	20·757	20·771	20·784	20·797	20·810	20·822
·03	14·093	14·104	14·114	14·125	14·136	14·146	14·157	14·167	14·178	14·188	·377	20·836	20·851	20·860	20·867	20·874	20·882	20·889	20·897	20·904	20·911
·04	14·199	14·209	14·220	14·230	14·241	14·251	14·262	14·272	14·283	14·293	·376	20·919	20·926	20·933	20·940	20·947	20·955	20·962	20·969	20·976	20·983
·05	14·304	14·314	14·327	14·335	14·346	14·356	14·367	14·377	14·388	14·398	·375	20·990	20·997	21·004	21·011	21·017	21·025	21·032	21·039	21·046	21·053
·06	14·409	14·419	14·430	14·440	14·451	14·462	14·473	14·484	14·495	14·506	·374	21·060	21·068	21·076	21·084	21·091	21·099	21·106	21·113	21·120	21·127
·07	14·517	14·528	14·538	14·548	14·559	14·570	14·581	14·592	14·603	14·614	·373	21·134	21·141	21·148	21·153	21·159	21·166	21·172	21·178	21·184	21·190
·08	14·625	14·635	14·646	14·657	14·668	14·679	14·690	14·701	14·712	14·723	·372	21·196	21·202	21·209	21·214	21·220	21·227	21·232	21·238	21·245	21·250
·09	14·734	14·745	14·755	14·766	14·777	14·788	14·799	14·810	14·821	14·832	·371	21·256	21·262	21·268	21·274	21·279	21·285	21·291	21·296	21·301	21·306
·10	14·843	14·854	14·865	14·876	14·887	14·898	14·909	14·920	14·931	14·942	·370	21·312	21·317	21·323	21·329	21·335	21·342	21·347	21·352	21·357	21·361
·11	14·953	14·964	14·975	14·986	14·997	15·008	15·019	15·030	15·041	15·052	·36	21·402	21·443	21·484	21·524	21·564	21·604	21·644	21·684	21·724	21·764
·12	15·064	15·075	15·086	15·097	15·109	15·120	15·131	15·142	15·154	15·165	·35	21·796	21·829	21·862	21·895	21·928	21·960	21·993	22·025	22·058	22·090
·13	15·177	15·188	15·200	15·211	15·223	15·234	15·246	15·257	15·269	15·280	·34	22·118	22·147	22·176	22·205	22·233	22·256	22·291	22·319	22·348	22·377
·14	15·292	15·303	15·314	15·326	15·337	15·348	15·360	15·371	15·382	15·393	·33	22·402	22·427	22·452	22·477	22·502	22·527	22·552	22·577	22·601	22·625
·15	15·405	15·417	15·428	15·440	15·451	15·463	15·474	15·485	15·497	15·509	·32	22·648	22·671	22·694	22·717	22·743	22·763	22·786	22·809	22·832	22·855
·16	15·521	15·533	15·545	15·556	15·568	15·580	15·591	15·603	15·615	15·626	·31	22·878	22·899	22·920	22·941	22·962	22·983	23·005	23·026	23·048	23·069
·17	15·638	15·650	15·662	15·674	15·686	15·698	15·710	15·722	15·734	15·746	·30	23·088	23·108	23·128	23·149	23·169	23·190	23·210	23·229	23·251	23·272
·18	15·758	15·770	15·782	15·794	15·806	15·818	15·830	15·842	15·855	15·867	·29	23·292	23·311	23·330	23·349	23·368	23·387	23·406	23·425	23·444	23·463
·19	15·880	15·892	15·905	15·917	15·930	15·942	15·955	15·967	15·980	15·993	·28	23·482	23·500	23·519	23·537	23·556	23·574	23·593	23·611	23·630	23·648
·20	16·006	16·018	16·031	16·043	16·056	16·068	16·081	16·093	16·105	16·118	·27	23·666	23·683	23·701	23·719	23·736	23·754	23·772	23·789	23·807	23·825
·21	16·131	16·144	16·157	16·170	16·183	16·195	16·208	16·221	16·234	16·246	·26	23·842	23·859	23·876	23·893	23·910	23·927	23·944	23·962	23·978	23·990
·22	16·259	16·272	16·286	16·299	16·313	16·326	16·340	16·353	16·367	16·380	·25	24·012	24·029	24·046	24·062	24·079	24·099	24·112	24·123	24·145	24·161
·23	16·393	16·407	16·421	16·434	16·448	16·462	16·475	16·489	16·503	16·516	·24	24·177	24·191	24·209	24·225	24·241	24·257	24·273	24·289	24·305	24·321
·24	16·530	16·544	16·558	16·572	16·586	16·600	16·614	16·628	16·642	16·656	·23	24·337	24·352	24·368	24·384	24·399	24·415	24·431	24·446	24·462	24·478
·25	16·670	16·684	16·699	16·713	16·728	16·742	16·757	16·771	16·786	16·801	·22	24·493	24·508	24·524	24·539	24·555	24·570	24·586	24·599	24·617	24·632
·26	16·816	16·831	16·846	16·861	16·876	16·891	16·906	16·921	16·936	16·951	·21	24·647	24·661	24·676	24·691	24·706	24·724	24·735	24·750	24·766	24·780
·27	16·966	16·982	16·998	17·013	17·029	17·045	17·060	17·076	17·092	17·107	·20	24·795	24·810	24·824	24·838	24·853	24·867	24·882	24·896	24·911	24·925
·28	17·123	17·139	17·156	17·172	17·189	17·214	17·222	17·238	17·255	17·271	·19	24·940	24·955	24·970	24·984	24·998	25·007	25·028	25·038	25·057	25·071
·29	17·288	17·305	17·322	17·339	17·356	17·373	17·390	17·407	17·424	17·441	·18	25·086	25·100	25·115	25·129	25·143	25·157	25·171	25·185	25·199	25·213
·30	17·459	17·478	17·496	17·515	17·533	17·552	17·570	17·589	17·607	17·625	·17	25·227	25·241	25·255	25·269	25·283	25·299	25·311	25·325	25·339	25·353
·31	17·644	17·661	17·681	17·700	17·720	17·739	17·758	17·777	17·796	17·815	·16	25·367	25·380	25·394	25·408	25·421	25·435	25·449	25·462	25·476	25·490
·32	17·836	17·857	17·878	17·899	17·920	17·941	17·962	17·983	18·004	18·025	·15	25·504	25·518	25·532	25·545	25·558	25·572	25·585	25·599	25·612	25·626
·33	18·046	18·068	18·090	18·113	18·136	18·159	18·182	18·195	18·218	18·241	·14	25·639	25·652	25·665	25·678	25·692	25·705	25·718	25·732	25·745	25·759
·34	18·274	18·301	18·328	18·354	18·381	18·408	18·434	18·461	18·488	18·515	·13	25·773	25·786	25·800	25·811	25·827	25·840	25·854	25·867	25·881	25·894
·35	18·541	18·571	18·602	18·632	18·663	18·693	18·724	18·755	18·786	18·817	·12	25·908	25·921	25·935	25·948	25·961	25·974	25·988	26·001	26·014	26·027
·36	18·847	18·885	18·923	18·961	18·999	19·037	19·075	19·113	19·152	19·191	·11	26·041	26·054	26·067	26·080	26·093	26·106	26·119	26·132	26·145	26·158
·370	19·230	19·234	19·239	19·244	19·249	19·254	19·260	19·266	19·272	19·277	·10	26·171	26·184	26·197	26·210	26·223	26·236	26·249	26·262	26·275	26·288
·371	19·283	19·288	19·293	19·298	19·304	19·309	19·314	19·319	19·325	19·331	·09	26·301	26·314	26·327	26·340	26·353	26·366	26·379	26·392	26·404	26·417
·372	19·337	19·342	19·349	19·355	19·360	19·365	19·371	19·377	19·383	19·389	·08	26·430	26·443	26·456	26·469	26·482	26·495	26·508	26·521	26·534	26·546
·373	19·395	19·401	19·407	19·413	19·419	19·424	19·430	19·436	19·442	19·449	·07	26·559	26·572	26·585	26·598	26·611	26·624	26·637	26·649	26·661	26·674
·374	19·456	19·463	19·470	19·477	19·484	19·490	19·497	19·505	19·513	19·521	·06	26·687	26·700	26·713	26·726	26·739	26·752	26·765	26·777	26·790	26·802
·375	19·528	19·535	19·542	19·549	19·556	19·562	19·568	19·575	19·582	19·589	·05	26·815	26·827	26·840	26·852	26·865	26·877	26·890	26·902	26·915	26·927
·376	19·596	19·603	19·610	19·617	19·624	19·630	19·637	19·644	19·651	19·658	·04	26·940	26·952	26·965	26·977	26·990	27·002	27·015	27·027	27·040	27·052
·377	19·666	19·673	19·680	19·688	19·695	19·701	19·708	19·716	19·724	19·739	·03	27·065	27·077	27·090	27·102	27·115	27·127	27·140	27·153	27·165	27·178
·378	19·753	19·765	19·778	19·791	19·804	19·816	19·829	19·841	19·853	19·865	·02	27·191	27·204	27·217	27·229	27·242	27·255	27·267	27·280	27·293	27·305
·379	19·877	19·890	19·903	19·916	19·929	19·940	19·952	19·965	19·978	19·991	·01	27·318	27·330	27·343	27·355	27·368	27·380	27·393	27·405	27·418	27·430
·380	20·003	20·027	20·055	20·083	20·126	20·154	20·195	20·212	20·251	20·284	·00	27·443	27·455	27·462	27·480	27·493	27·505	27·518	27·530	27·542	27·555

g—EYE-TABLE FOR YOGAS.

Moon's anomaly and moon's equation of the centre in days and fractions of a day.

(ĀRYA SIDDHĀNTA.)

Eqn.	0	1	2	3	4	5	6	7	8	9	Eqn.	9	8	7	6	5	4	3	2	1	0
—	Moon's anomaly in days.										—	Moon's anomaly in days.									
·00	0·000	0·013	0·026	0·040	0·053	0·066	0·080	0·093	0·106	0·119	·354	...	...	...	...	...	7·243	7·275	7·306	7·338	7·370
·01	0·133	0·146	0·158	0·173	0·186	0·199	0·213	0·226	0·239	0·253	·353	7·402	7·434	7·466	7·498	7·530	7·543	7·557	7·571	7·584	7·598
·02	0·266	0·280	0·293	0·307	0·320	0·334	0·347	0·361	0·374	0·388	·352	7·612	7·625	7·639	7·653	7·666	7·679	7·693	7·706	7·720	7·734
·03	0·402	0·415	0·429	0·442	0·456	0·469	0·483	0·496	0·510	0·523	·351	7·747	7·761	7·775	7·788	7·802	7·814	7·822	7·830	7·838	7·845
·04	0·537	0·550	0·564	0·577	0·591	0·604	0·618	0·631	0·645	0·658	·350	7·853	7·860	7·868	7·875	7·883	7·889	7·897	7·904	7·912	7·919
·05	0·671	0·684	0·698	0·711	0·725	0·738	0·752	0·765	0·779	0·793	·34	7·993	8·067	8·118	8·169	8·220	8·271	8·322	8·373	8·424	8·475
·06	0·806	0·820	0·833	0·847	0·860	0·874	0·887	0·901	0·914	0·928	·33	8·513	8·550	8·587	8·624	8·662	8·699	8·736	8·774	8·811	8·848
·07	0·942	0·956	0·970	0·983	0·997	1·011	1·024	1·038	1·052	1·065	·32	8·879	8·910	8·941	8·972	9·003	9·034	9·065	9·095	9·125	9·155
·08	1·079	1·093	1·107	1·120	1·134	1·148	1·161	1·175	1·189	1·202	·31	9·181	9·207	9·233	9·259	9·285	9·311	9·337	9·363	9·388	9·413
·09	1·216	1·230	1·244	1·258	1·272	1·286	1·300	1·314	1·328	1·342	·30	9·437	9·461	9·485	9·509	9·533	9·557	9·581	9·605	9·628	9·651
·10	1·356	1·371	1·385	1·399	1·413	1·427	1·441	1·455	1·469	1·483	·29	9·672	9·693	9·714	9·735	9·756	9·777	9·798	9·819	9·840	9·860
·11	1·497	1·512	1·526	1·540	1·554	1·568	1·582	1·596	1·610	1·624	28	9·880	9·900	9·920	9·940	9·960	9·980	10·000	10·020	10·039	10·058
·12	1·638	1·652	1·666	1·681	1·695	1·710	1·724	1·739	1·753	1·768	·27	10·077	10·095	10·113	10·131	10·150	10·168	10·186	10·205	10·223	10·241
·13	1·782	1·797	1·812	1·826	1·840	1·854	1·868	1·882	1·896	1·910	·26	10·259	10·277	10·295	10·313	10·331	10·349	10·367	10·385	10·403	10·420
·14	1·924	1·938	1·952	1·967	1·981	1·996	2·010	2·025	2·039	2·053	·25	10·437	10·454	10·471	10·488	10·505	10·522	10·539	10·556	10·573	10·589
·15	2·068	2·083	2·098	2·113	2·128	2·143	2·158	2·173	2·188	2·203	·24	10·606	10·622	10·638	10·654	10·670	10·686	10·702	10·718	10·734	10·750
·16	2·218	2·232	2·247	2·262	2·277	2·292	2·307	2·322	2·337	2·352	·23	10·766	10·781	10·797	10·812	10·828	10·843	10·859	10·874	10·890	10·905
·17	2·367	2·382	2·397	2·413	2·428	2·443	2·459	2·474	2·489	2·504	·22	10·921	10·936	10·951	10·966	10·981	10·996	11·011	11·026	11·041	11·056
·18	2·520	2·535	2·551	2·566	2·582	2·597	2·613	2·628	2·644	2·659	·21	11·071	11·086	11·101	11·116	11·130	11·145	11·160	11·174	11·189	11·204
·19	2·675	2·691	2·707	2·722	2·738	2·754	2·769	2·785	2·801	2·816	·20	11·219	11·233	11·247	11·261	11·275	11·289	11·303	11·317	11·331	11·345
·20	2·832	2·848	2·864	2·880	2·896	2·912	2·928	2·944	2·960	2·976	·19	11·359	11·372	11·386	11·400	11·413	11·427	11·441	11·454	11·468	11·482
·21	2·993	3·010	3·027	3·043	3·060	3·077	3·093	3·110	3·127	3·144	·18	11·496	11·509	11·523	11·536	11·550	11·563	11·577	11·590	11·604	11·617
·22	3·161	3·178	3·195	3·212	3·229	3·246	3·263	3·280	3·297	3·314	·17	11·631	11·644	11·657	11·670	11·684	11·697	11·710	11·724	11·737	11·750
·23	3·332	3·349	3·367	3·384	3·402	3·419	3·437	3·454	3·472	3·489	·16	11·763	11·776	11·789	11·802	11·815	11·828	11·841	11·854	11·867	11·879
·24	3·507	3·525	3·543	3·561	3·579	3·597	3·615	3·633	3·651	3·669	·15	11·892	11·905	11·918	11·931	11·944	11·957	11·970	11·983	11·996	12·009
·25	3·688	3·706	3·725	3·744	3·763	3·782	3·801	3·820	3·839	3·858	·14	12·022	12·034	12·046	12·059	12·071	12·084	12·096	12·109	12·121	12·133
·26	3·877	3·896	3·916	3·936	3·956	3·976	3·996	4·016	4·036	4·056	·13	12·145	12·157	12·169	12·181	12·193	12·205	12·217	12·229	12·242	12·255
·27	4·076	4·096	4·116	4·137	4·157	4·177	4·198	4·218	4·238	4·258	·12	12·267	12·280	12·292	12·305	12·317	12·330	12·342	12·355	12·367	12·379
·28	4·279	4·300	4·321	4·343	4·365	4·387	4·409	4·431	4·453	4·475	·11	12·391	12·403	12·415	12·427	12·439	12·451	12·463	12·475	12·487	12·500
·29	4·497	4·519	4·542	4·565	4·588	4·611	4·634	4·657	4·680	4·703	·10	12·512	12·524	12·536	12·549	12·560	12·572	12·584	12·596	12·608	12·621
·30	4·726	4·751	4·776	4·802	4·828	4·854	4·880	4·906	4·932	4·958	·09	12·633	12·645	12·657	12·669	12·681	12·693	12·705	12·717	12·729	12·741
·31	4·984	5·011	5·038	5·066	5·094	5·122	5·150	5·178	5·206	5·234	·08	12·753	12·764	12·776	12·788	12·799	12·811	12·823	12·834	12·846	12·858
·32	5·262	5·294	5·326	5·358	5·391	5·424	5·457	5·490	5·523	5·556	·07	12·870	12·881	12·893	12·905	12·916	12·928	12·940	12·951	12·963	12·975
·33	5·589	5·628	5·667	5·706	5·745	5·785	5·825	5·864	5·903	5·942	·06	12·987	12·999	13·010	13·022	13·033	13·045	13·056	13·068	13·079	13·091
·34	5·982	6·035	6·088	6·141	6·194	6·247	6·300	6·353	6·406	6·482	·05	13·102	13·114	13·126	13·137	13·149	13·160	13·172	13·183	13·195	13·206
·350	6·558	6·565	6·573	6·580	6·588	6·596	6·604	6·611	6·619	6·626	·04	13·217	13·228	13·240	13·251	13·263	13·274	13·286	13·297	13·309	13·320
·351	6·634	6·641	6·649	6·657	6·665	6·680	6·694	6·707	6·721	6·735	·03	13·332	13·343	13·355	13·366	13·378	13·389	13·401	13·412	13·424	13·435
·352	6·748	6·762	6·776	6·789	6·803	6·818	6·831	6·845	6·859	6·872	·02	13·447	13·459	13·470	13·482	13·493	13·505	13·516	13·528	13·539	13·551
·353	6·886	6·900	6·913	6·927	6·941	6·956	6·988	7·020	7·052	7·084	·01	13·562	13·574	13·585	13·596	13·608	13·619	13·630	13·642	13·653	13·664
·354	7·116	7·148	7·180	7·211	7·243	...	...	...	...	...	·00	13·676	13·687	13·698	13·709	13·721	13·732	13·743	13·755	13·766	13·777

9—EYE-TABLE FOR YOGAS—*continued.*

Moon's anomaly and moon's equation of the centre in days and fractions of a day.

(ĀRYA SIDDHĀNTA.)

Eqn. +	0	1	2	3	4	5	6	7	8	9	Eqn. +	9	8	7	6	5	4	3	2	1	0
	Moon's anomaly in days.											Moon's anomaly in days.									
·00	13·777	13·788	13·799	13·811	13·822	13·833	13·845	13·856	13·867	13·878	**·354**	...	...	...	...	...	20·312	20·344	20·375	20·407	20·439
·01	13·890	13·901	13·912	13·924	13·935	13·946	13·958	13·969	13·980	13·992	**·353**	20·471	20·503	20·535	20·567	20·599	20·614	20·628	20·642	20·655	20·669
·02	14·003	14·015	14·026	14·038	14·049	14·061	14·072	14·084	14·095	14·107	**·352**	20·683	20·696	20·710	20·724	20·737	20·752	20·766	20 779	20·793	20·807
·03	14·119	14·130	14·142	14·153	14·165	14·176	14·188	14·199	14·211	14·222	**·351**	20·820	20·834	20·848	20·862	20·875	20·889	20·897	20·905	20·913	20·920
·04	14·234	14·245	14·257	14·268	14·279	14·291	14·302	14·314	14·325	14·337	**·350**	20·928	20·935	20·943	20·950	20·958	20·966	20·974	20·981	20·989	20·996
·05	14·348	14·359	14·371	14·382	14·394	14·405	14·417	14·428	14·440	14·452	**·34**	21·072	21·148	21·201	21·254	21·307	21·360	21·413	21·466	21·519	21·572
·06	14·463	14·475	14·486	14·498	14·509	14·521	14·532	14·544	14 555	14·567	**·33**	21·612	21·651	21·690	21·729	21·769	21·808	21·847	21·887	21·926	21·965
·07	14·579	14·591	14·603	14·614	14·626	14·638	14·649	14·661	14·673	14·684	**·32**	21·998	22·031	22·064	22·097	22·130	22·163	22·196	22·228	22·260	22 292
·08	14·696	14·708	14·720	14·731	14·743	14·755	14·766	14·778	14·790	14·801	**·31**	22·320	21·348	22·376	22·404	22·432	22 460	22·488	22·516	22·543	22·570
·09	14·813	14·825	14·837	14·849	14·861	14·873	14·885	14·897	14·909	14·921	**·30**	22·596	22·622	22·648	22·674	22·700	22·726	22·752	22·778	22·803	22·828
·10	14·933	14·946	14·958	14·970	14·982	14·994	15·006	15·018	15·030	15·042	**·29**	22·851	22·874	22·897	22·920	22·943	22·966	22·989	23·012	23·035	23·057
·11	15·054	15·067	15·079	15·091	15·103	15·115	15·127	15·139	15·151	15·163	**·28**	23·079	23·101	23·123	23·145	23·167	23·189	23·211	23·233	23·254	23·275
·12	15·175	15·187	15·199	15·212	15·224	15·237	15·249	15·262	15·274	15·287	**·27**	23·296	23·316	23·336	23·356	23·377	23·397	23·417	23·438	23·458	23·478
·13	15·299	15·312	15·325	15·337	15·349	15·361	15·373	15·385	15·397	15·409	**·26**	23·498	23·518	23·538	23·558	23·578	23·598	23·618	23·638	23·658	23·677
·14	15·421	15·433	15·445	15·458	15·470	15·483	15·495	15·508	15·520	15·532	**·25**	23·696	23·715	23·734	23·753	23·772	23·791	23·810	23·829	23·848	23·866
·15	15·545	15·558	15·571	15·584	15·597	15·610	15·623	15·636	15·649	15·662	**·24**	23·885	23·903	23·921	23·939	23·957	23·975	23·993	24·011	24·029	24·047
·16	15·675	15 687	15·700	15·713	15·726	15·739	15·752	15·765	15·778	15·791	**·23**	24·065	24·082	24·100	24·117	24·135	24·152	24·170	24·187	24·205	24·222
·17	15·804	15·817	15·830	15·844	15·857	15·870	15·884	15·897	15·910	15·923	**·22**	24·240	24·257	24·274	24·291	24·308	24·325	24·342	24·359	24·376	24·393
·18	15·937	15·950	15·964	15·977	15·991	16·004	16·018	16·031	16·045	16·058	**·21**	24·410	24·427	24·444	24·461	24·477	24·494	24·511	24·527	24·544	24·561
·19	16·072	16·086	16·100	16·113	16·127	16·141	16·154	16·168	16·182	16·195	**·20**	24·578	24·594	24·610	24·626	24·642	24·658	24·674	24·690	24·706	24·722
·20	16·209	16·223	16·237	16·251	16·265	16·279	16·293	16·307	16·321	16·335	**·19**	24·738	24·753	24·769	24·785	24·800	24·816	24·832	24·847	24·863	24·879
·21	16·350	16·365	16·380	16·394	16·409	16·424	16·438	16·453	16·468	16·483	**·18**	24·895	24·910	24·926	24·941	24·957	24·972	24·988	25·003	25·019	25·034
·22	16·498	16·513	16·528	16·543	16·558	16·573	16·588	16·603	16·618	16·633	**·17**	25·050	25·065	25·080	25·095	25·111	25·126	25·141	25·157	25·172	25·187
·23	16·649	16·664	16·680	16·695	16·711	16·726	16·742	16·757	16·773	16·788	**·16**	25·202	25·217	25·232	25·247	25·262	25·277	25·292	25·307	25·322	25·336
·24	16·804	16·820	16·836	16·852	16·868	16·884	16·900	16·916	16·932	16·948	**·15**	25·351	25·366	25·381	25·396	25·411	25·426	25·441	25·456	25·471	25·486
·25	16·966	16·982	16·999	17·016	17·033	17·050	17·067	17·084	17·101	17·118	**·14**	25·501	25·515	25·529	25·544	25·558	25·573	25·587	25·602	25·616	25·630
·26	17·135	17·152	17·170	17·188	17·206	17·224	17·242	17·260	17·278	17·296	**·13**	25·644	25·658	25·672	25·686	25·700	25·714	25·728	25·742	25·757	25·772
·27	17·314	17·332	17·350	17·369	17·387	17·405	17·424	17·442	17·460	17·478	**·12**	25·786	25·801	25·815	25·830	25·844	25·859	25·873	25·888	25·902	25·916
·28	17·497	17·516	17·535	17·555	17·575	17·595	17·615	17·635	17·655	17·675	**·11**	25·930	25·944	25·958	25·972	25·986	26·000	26·014	26·028	26·042	26·057
·29	17·695	17·715	17·736	17·757	17·778	17·799	17·820	17·841	17·862	17·883	**·10**	26·071	26·085	26·099	26·113	26·127	26·141	26·155	26·169	26·183	26·198
·30	17·904	17·927	17·950	17·974	17·998	18·022	18·046	18·070	18·094	18·118	**·09**	26·212	26·226	26·240	26·254	26·268	26·282	26·296	26·310	26·324	26·338
·31	18·142	18·167	18·192	18·218	18·244	18·270	18·296	18·322	18·348	18·374	**·08**	26·352	26·365	26·379	26·393	26·406	26·420	26·434	26·447	26·461	26·475
·32	18·400	18·430	18·460	18·490	18·521	18·552	18·583	18·614	18·645	18·676	**·07**	26·489	26·502	26·516	26·530	26·543	26·557	26·571	26·584	26·598	26·612
·33	18·707	18·744	18·781	18·819	18·856	18·893	18·931	18·968	19·005	19·042	**·06**	26·626	26·640	26·653	26·667	26·680	26·694	26·707	26·721	26·734	26·748
·34	19·080	19·131	19·182	19·233	19·284	19·335	19·386	19·437	19·488	19·562	**·05**	26·761	26·775	26·789	26·802	26·816	26·829	26·843	26·856	26·870	26·883
·350	19·636	19·643	19·651	19·658	19·666	19·672	19·680	19·687	19·695	19·702	**·04**	26·896	26·910	26·923	26·937	26·950	26·964	26·977	27·990	27·004	27·017
·351	19·710	19·717	19·725	19·733	19·741	19·754	19·768	19·781	19·795	19·809	**·03**	27·031	27·044	27·058	27·071	27·085	27·098	27·112	27·125	27·139	27·152
·352	19·822	19·836	19·850	19·863	19·877	19·890	19·903	19·917	19·931	19·944	**·02**	27·166	27·180	27·193	27·207	27·220	27·234	27·247	27·291	27·274	27·288
·353	19·958	19 972	19·985	19·999	20·013	20·025	20·057	20·089	20·121	20·153	**·01**	27·301	27·315	27·328	27·341	27·355	27·368	27·381	27·395	27·408	27·421
·354	20·185	20·217	20·249	20·280	20·312	...	...	...	...	...	**·00**	27·435	27·448	27·461	27·474	27·488	27·501	27·514	27·528	27·541	27·555

h—EYE-TABLE FOR TITHIS.

Sun's anomaly and equation of the centre expressed in days and fractions of a day.

(ĀRYA SIDDHĀNTA.)

Eqn. +	9	8	7	6	5	4	3	2	1	0
	Sun's anomaly in days of the solar year.									
·173	...	...	...	...	0·02	0·12	0·32	0·52	0·72	0·92
·172	1·23	1·38	1·52	1·66	1·80	1·94	2·08	2·22	2·36	2·50
·171	2·64	2·78	2·92	3·06	3·20	3·34	3·48	3·62	3·76	3·90
·170	4·04	4·18	4·32	4·46	4·60	4·73	4·86	4·99	5·12	5·25
·16	6·45	7·59	8·74	9·16	10·64	11·58	12·55	13·33	14·13	14·93
·15	15·72	16·52	17·22	17·92	18·62	19·32	20·02	20·67	21·30	21·93
·14	22·54	23·17	23·80	24·39	24·97	25·53	26·10	26·67	27·23	27·80
·13	28·35	28·84	29·36	29·88	30·41	30·93	31·44	31·94	32·43	32·91
·12	33·39	33·87	34·35	34·84	35·33	35·79	36·25	36·70	37·15	37·61
·11	38·05	38·50	38·96	39·41	39·84	40·27	40·70	41·12	41·55	41·98
·10	42·40	42·82	43·24	43·65	44·06	44·47	44·88	45·28	45·69	46·10
·09	46·49	46·90	47·29	47·68	48·08	48·47	48·86	49·25	49·64	50·03
·08	50·41	50·80	51·19	51·55	51·93	52·31	52·68	53·05	53·43	53·80
·07	54·16	54·54	54·90	55·27	55·64	56·00	56·37	56·73	57·09	57·46
·06	57·81	58·17	58·53	58·88	59·25	59·60	59·96	60·31	60·66	61·02
·05	61·36	61·72	62·07	62·42	62·78	63·12	63·47	63·81	64·16	64·51
·04	64·84	65·19	65·53	65·88	66·23	66·57	66·91	67·25	67·59	67·93
·03	68·26	68·59	68·93	69·27	69·62	69·97	70·31	70·64	70·98	71·31
·02	71·64	71·97	72·31	72·65	73·00	73·33	73·66	73·99	74·32	74·66
·01	74·98	75·31	75·64	75·98	76·32	76·65	76·98	77·31	77·65	77·98
·00	78·30	78·63	78·96	79·29	79·63	79·96	80·29	80·62	80·96	81·29

Eqn. −	0	1	2	3	4	5	6	7	8	9
	Sun's anomaly in days of the solar year.									
·00	81·29	81·62	81·95	82·28	82·61	82·94	83·28	83·61	83·94	84·28
·01	84·60	84·93	85·26	85·59	85·92	86·26	86·60	86·93	87·26	87·60
·02	87·92	88·25	88·58	88·91	89·24	89·58	89·92	90·26	90·60	90·93
·03	91·26	91·59	91·93	92·27	92·60	92·95	93·30	93·64	93·98	94·32
·04	94·65	94·99	95·32	95·66	96·00	96·34	96·69	97·04	97·39	97·73
·05	98·07	98·41	98·76	99·11	99·45	99·80	100·15	100·50	100·86	101·26
·06	101·55	101·91	102·26	102·62	102·97	103·32	103·69	104·04	104·40	104·76
·07	105·12	105·48	105·84	106·21	106·57	106·93	107·31	107·67	108·03	108·41
·08	108·77	109·15	109·52	109·89	110·27	110·64	111·02	111·40	111·77	112·16
·09	112·54	112·93	113·32	113·71	114·10	114·49	114·89	115·28	115·68	116·08
·10	116·48	116·88	117·29	117·70	118·10	118·51	118·92	119·33	119·75	120·18
·11	120·59	121·02	121·45	121·88	122·30	122·73	123·17	123·61	124·07	124·52
·12	124·97	125·42	125·87	126·33	126·78	127·24	127·74	128·22	128·70	129·19
·13	129·66	130·14	130·63	131·13	131·65	132·17	132·67	133·22	133·74	134·26
·14	134·77	135·34	135·91	136·47	137·04	137·61	138·18	138·78	139·40	140·03
·15	140·65	141·27	141·90	142·55	143·25	143·95	144·66	145·36	146·06	146·86
·16	147·65	148·45	149·25	150·03	150·99	151·93	152·88	153·83	154·98	156·12
·170	157·33	157·46	157·60	157·73	157·87	158·00	158·14	158·28	158·42	158·56
·171	158·70	158·84	158·98	159·12	159·26	159·40	159·54	159·68	159·82	159·96
·172	160·10	160·24	160·38	160·52	160·66	160·80	160·94	161·08	161·22	161·36
·173	161·56	161·76	161·96	162·16	162·36	162·56	162·76	162·96	163·16	163·36
·174	163·56	163·76	163·96	164·16	164·36	164·56	164·76	164·96	165·17	165·51
·175	165·86	166·20	166·55	166·89	167·24	167·58	167·94	168·28	168·63	168·98
·176	169·93	170·88	171·83	172·78	...	...	...	...	...	...

Eqn. −	9	8	7	6	5	4	3	2	1	0
·176	...	...	...	...	...	...	172·78	173·73	174·68	175·63
·175	176·59	176·94	177·29	177·63	177·97	178·31	178·66	179·00	179·35	179·69
·174	180·04	180·38	180·59	180·79	180·99	181·19	181·39	181·59	181·79	181·99
·173	182·19	182·39	182·59	182·79	182·99	183·19	183·39	183·59	183·79	183·99
·172	184·19	184·33	184·47	184·61	184·75	184·89	185·03	185·17	185·31	185·45
·171	185·59	185·73	185·87	186·01	186·15	186·29	186·43	186·57	186·71	186·85
·170	186·99	187·13	187·25	187·39	187·53	187·66	187·80	187·94	188·08	188·22
·16	189·44	190·48	191·72	192·67	193·60	194·54	195·50	196·28	197·04	197·88
·15	198·69	199·48	200·18	200·88	201·56	202·26	202·96	203·61	204·23	204·86
·14	205·49	206·12	206·74	207·33	207·89	208·45	209·02	209·58	210·15	210·71
·13	211·25	211·76	212·28	212·80	213·31	213·82	214·34	214·84	215·32	215·80
·12	216·29	216·78	217·26	217·74	218·21	218·67	219·12	219·57	220·03	220·48
·11	220·94	221·39	221·84	222·29	222·70	223·13	223·55	223·98	224·40	224·83
·10	225·26	225·69	226·11	226·51	226·90	227·31	227·71	228·22	228·52	228·93
·09	229·34	229·74	230·13	230·52	230·90	231·29	231·68	232·07	232·46	232·84
·08	233·24	233·63	234·00	234·37	234·73	235·10	235·48	235·85	236·22	236·59
·07	236·97	237·34	237·71	238·07	238·42	238·78	239·14	239·50	239·86	240·23
·06	240·60	240·96	241·31	241·67	242·01	242·36	242·71	243·06	243·42	243·77
·05	244·13	244·48	244·83	245·18	245·52	245·86	246·20	246·55	246·89	247·24
·04	247·59	247·93	248·28	248·62	248·95	249·29	249·63	249·96	250·30	250·64
·03	250·98	251·32	251·66	251·99	252·32	252·67	253·00	253·34	253·67	254·00
·02	254·35	254·68	255·02	255·35	255·68	256·01	256·34	256·67	257·00	257·33
·01	257·67	257·98	258·33	258·66	258·98	259·31	259·64	259·97	260·30	260·63
·00	260·97	261·29	261·62	261·95	262·27	262·60	262·93	263·26	263·59	263·92

Eqn. +	0	1	2	3	4	5	6	7	8	9
·00	263·92	264·25	264·57	264·90	265·23	265·56	265·88	266·21	266·54	266·87
·01	267·21	267·53	267·86	268·19	268·53	268·86	269·18	269·51	269·84	270·17
·02	270·51	270·84	271·17	271·50	271·82	272·16	272·48	272·82	273·15	273·48
·03	273·83	274·16	274·50	274·83	275·17	275·51	275·84	276·18	276·51	276·85
·04	277·20	277·53	277·87	278·21	278·54	278·88	279·21	279·56	279·90	280·24
·05	280·60	280·94	281·29	281·63	281·97	282·32	282·65	283·00	283·35	283·70
·06	284·06	284·42	284·77	285·12	285·47	285·82	286·17	286·52	286·88	287·24
·07	287·61	287·97	288·33	288·69	289·05	289·41	289·77	290·13	290·49	290·79
·08	291·24	291·61	291·99	292·36	292·73	293·10	293·46	293·83	294·21	294·59
·09	294·99	295·38	295·77	296·15	296·54	296·93	297·31	297·70	298·09	298·56
·10	298·91	299·31	299·72	300·12	300·52	300·93	301·32	301·73	302·14	302·57
·11	303·00	303·43	303·85	304·28	304·70	305·13	305·54	305·99	306·44	306·89
·12	307·36	307·81	308·26	308·71	309·16	309·62	310·09	310·58	311·06	311·54
·13	312·13	312·51	312·99	313·49	314·01	314·59	315·04	315·55	316·07	316·59
·14	317·12	317·69	318·25	318·82	319·38	319·85	320·50	321·09	321·72	322·34
·15	322·98	323·60	324·22	324·87	325·57	326·27	326·96	327·65	328·34	329·15
·16	329·96	330·75	331·55	332·34	333·29	334·23	335·16	336·11	337·25	338·40
·170	339·62	339·75	339·89	340·02	340·16	340·29	340·43	340·57	340·71	340·85
·171	340·99	341·13	341·27	341·41	341·55	341·69	341·83	341·97	342·11	342·25
·172	342·39	342·53	342·67	342·81	342·95	343·09	343·23	343·37	343·51	343·65
·173	343·85	344·05	344·25	344·45	344·65	344·85	345·05	345·25	345·45	345·65
174	345·85	346·05	346·25	346·45	346·65	346·85	347·05	347·25	347·46	347·80
·175	348·15	348·49	348·84	349·18	349·53	349·87	350·21	350·55	350·90	351·25
·176	352·20	353·15	354·10	355·05	...	...	...	...	...	...

Eqn. −	9	8	7	6	5	4	3	2	1	0
·176	...	...	...	...	...	...	355·05	356·00	356·95	357·90
·175	358·86	359·21	359·56	359·90	360·26	360·60	360·95	361·29	361·64	361·98
·174	362·33	362·67	362·88	363·08	363·28	363·48	363·68	363·88	364·08	364·28
·173	364·48	364·68	364·88	365·08	...	...	...	...	...	...

i—EYE-TABLE FOR YOGAS.

Sun's anomaly and equation of the centre expressed in days and fractions of a day.

(ĀRYA SIDDHĀNTA.)

Eqn. −	9	8	7	6	5	4	3	2	1	0
	Sun's anomaly in days of the solar year.									
·14	1·22	2·91	4·59	6·27	7·40	8·55	9·70	10·88	12·00	13·15
·13	14·00	14·85	15·70	16·84	17·37	18·21	19·06	19·90	20·75	21·59
·12	22·37	22·95	23·63	24·31	24 98	25·56	26 34	27·02	27·70	28·38
·11	28·97	29·55	30 14	30·72	31·30	31·88	32 47	33·05	33·64	34·22
·10	34 75	35·29	35·82	36 35	36·83	37·41	37·94	38·48	39·01	39·54
·09	40·03	40 53	41·02	41·52	42·00	42·50	42·99	43·49	43·98	44·47
·08	44·93	45·40	45·86	46·32	46·77	47·23	47·69	48·15	48·61	49 07
·07	49·51	49·95	50 39	50 83	51·26	51·70	52·14	52·58	53 02	53·47
·06	53·89	54·31	54·74	55·17	55 59	56·01	56·44	56·86	57 28	57·70
·05	58·11	58·52	58·93	59·34	59·74	60·15	60·56	60·97	61·38	61·79
·04	62·20	62·60	63·01	63·41	63·80	64·20	64·60	65·00	65·40	65·80
·03	66·20	66·60	67 00	67·41	67·78	68·17	68·57	68·96	69·36	69·75
·02	70·14	70·53	70·92	71·31	71·69	72·08	72·47	72·86	73·25	73·63
·01	74·02	74·41	74·79	75·17	75 54	75·92	76·31	76·70	77·08	77·47
·00	77·86	78·25	78·64	79·02	79·39	79·77	80·15	80·53	80·91	81·29

Eqn. +	...	...	...	...	...	...	...	...	...	...
	Sun's anomaly in days of the solar year.									
·151	...	...	172·95	174·09	175·22	176·35	176·73	177·12	177·51	177·90
·150	178·29	178·68	179·07	179·46	179·85	180·23	180·47	180·70	180·93	181·16
·14	183·55	185·24	186·92	188·60	189·76	190·91	192·06	193·21	194·36	195·51
·13	196·36	197·20	198·05	198·89	199·75	200·59	201·44	202·28	203·13	203·97
·12	204·65	205·33	206·01	206·69	207·38	208 06	208·74	209·42	210·10	210·78
·11	211·37	211·95	212·54	213·12	213·72	214·30	214·89	215·47	216·06	216·64
·10	217·17	217·71	218·24	218·77	219·32	219·85	220·38	220·92	221·45	221·98
·09	222·47	222·97	223·46	223·96	224·46	224·96	225·45	225·95	226·44	226·93
·08	227·40	227·86	228·32	228·78	229·25	229·71	230·17	230·63	231·09	231·54
·07	231·99	232·43	232·87	233·31	233·76	234·20	234·64	235·08	235·52	235·96
·06	236·38	236·80	237·23	237·66	238·10	238·52	238·95	239·37	239·79	240·21
·05	240·62	241·03	241·44	241·85	242·27	242·68	243·09	243·50	243·91	244·33
·04	244·74	245·15	245·56	245·96	246·37	246·77	247·17	247·57	247·97	248·37
·03	248·77	249·17	249 57	249·96	250·37	250·76	251·16	251 55	251·94	252·34
·02	252·73	253·12	253·51	253·90	254·30	254·69	255 08	255·46	255·84	256·24
·01	256·63	257·02	257·40	257·78	258·17	258·56	258·94	259·32	259·70	260·08
·00	260·47	260·86	261·25	261·63	262·02	262·40	262·78	263·16	263·54	263·92

Eqn. +	0	1	2	3	4	5	6	7	8	9
	Sun's anomaly in days of the solar year.									
·00	81·29	81·67	82·05	82·43	82·81	83·19	83·56	83·94	84·33	84·72
·01	85·11	85·49	85·87	86·26	86·65	87·03	87·40	87·78	88·16	88·55
·02	88·94	89·32	89·71	90·10	90 49	90·88	91·26	91·65	92·04	92·43
·03	92·82	93·21	93·61	94·00	94·40	94·79	95·18	95·57	95·97	96·37
·04	96·77	97·17	97·57	97·97	98·37	98·77	99·16	99·56	99·97	100·38
·05	100·79	101·20	101·61	102·02	102·43	102·84	103·24	103·65	104·06	104·47
·06	104·88	105·30	105·72	106·14	106·57	106·99	107·41	107·84	108·27	108·69
·07	109·11	109·55	109·99	110·43	110·87	111·31	111·74	112·18	112·62	113·06
·08	113·50	113·96	114·42	114·88	115·34	115·80	116·25	116·71	117·17	117·64
·09	118·11	118·60	119·09	119·59	120·08	120·59	121·06	121·56	122·05	122·55
·10	123·04	123·57	124·10	124·64	125·17	125·70	126·23	126·76	127·29	127·83
·11	128·36	128·94	129·53	130·11	130·70	131·28	131·86	132·44	133·03	133·61
·12	134·20	134·88	135·56	136·24	136·92	137·60	138·27	138·95	139·63	140·31
·13	140·99	141·83	142·68	143·52	144·37	145·21	146·05	146·89	147·74	148·58
·14	149·43	150·58	151·73	152·88	154·53	155·18	156·81	157·59	159·67	161·36
·150	163·76	163·99	164·22	164·45	164·69	165·08	165·47	165·86	166·25	166·64
·151	167·03	167·41	167·80	168·19	168·57	169·70	170·83	171·96	...	...

Maximum 172·45 has equation ·15174.

Eqn. −	0	1	2	3	4	5	6	7	8	9
	Sun's anomaly in days of the solar year.									
·00	263·92	264·30	264·68	265·06	265·44	265·82	266·21	266·59	266·98	267·37
·01	267·75	268·13	268·51	268·90	269·29	269·67	270·06	270·44	270·82	271·21
·02	271·61	271·99	272·38	272·77	273·16	273·55	273·95	274·34	274·73	275·12
·03	275·50	275·89	276·29	276·68	277·08	277·47	277·88	278·27	278·67	279·07
·04	279·47	279·87	280·27	280·67	281·07	281·47	281·88	282·28	282·69	289·09
·05	283·50	283·91	284·32	284·73	285·14	285·55	285·97	286·38	256·79	287·20
·06	287·62	288·04	288·46	288 88	289·31	289·73	290·17	290·60	291·03	291·45
·07	291·87	292·31	292 75	293·19	293·63	294·07	294·52	294·96	295·40	295·84
·08	296·28	296·74	297·20	297·66	298·12	298·58	299·05	299·51	299·97	300·44
·09	300·90	301·39	301·88	302·38	302·87	303·37	303·87	304·37	304·86	305·36
·10	305·85	306·38	306·91	307·45	307·98	308·51	309·06	309·59	310·12	310·66
·11	311·19	311·77	312·36	312·94	313·53	314·11	314·71	315·29	315·88	316·46
·12	317·05	317·73	318·41	319·09	319·77	320·45	321·14	321·82	322·50	323·18
·13	323·86	324 70	325 55	326·39	327·24	328·08	328·93	329·77	350·62	331·47
·14	332·32	333·47	334·62	335·77	336·92	338·07	339·24	340·92	342·60	344·29
·150	346·67	346 90	347·13	347·36	347·60	347·99	348·38	348·77	349·16	349·55
·151	349·94	350·33	350·72	351·11	351·49	352·62	353·75	354·89		

Eqn. +	9	8	7	6	5	4	3	2	1	0
	Sun's anomaly in days of the solar year.									
·151	...	...	355·88	357·01	358·14	359·27	359·65	360·04	360·42	360·81
·150	361·20	361·59	361·98	362·37	362·76	363·15	363·39	363·62	363·85	364·08

e—EYE-TABLE FOR TITHIS.—(BRAHMA SIDDHĀNTA AND SIDDHĀNTA ŚIROMANI.)

Moon's anomaly and equation of the centre expressed in days and fractions of a day.

Eqn.	0	1	2	3	4	5	6	7	8	9	Eqn.	9	8	7	6	5	4	3	2	1	0
				Moon's anomaly in days.											Moon's anomaly in days.						
·00	0·000	0·012	0·023	0·035	0·046	0·058	0·069	0·081	0·093	0·104	·413	...	...	...	...	...	...	...	...	...	7·301
·01	0·116	0·127	0·139	0·151	0·162	0·174	0·186	0·198	0·209	0·221	·412	7·337	7·373	7·409	7·444	7·480	7·516	7·552	7·587	7·605	7·616
·02	0·233	0·244	0·256	0·268	0·279	0·291	0·303	0·314	0·326	0·338	·411	7·627	7·638	7·649	7·660	7·670	7·681	7·692	7·703	7·714	7·725
·03	0·349	0·361	0·373	0·388	0·396	0·408	0·419	0·431	0·443	0·454	·410	7·736	7·747	7·758	7·769	7·779	7·790	7·801	7·812	7·823	7·834
·04	0·466	0·478	0·489	0·501	0·513	0·525	0·536	0·547	0·559	0·571	·409	7·844	7·854	7·864	7·874	7·880	7·887	7·894	7·901	7·908	7·915
·05	0·582	0·594	0·606	0·617	0·629	0·641	0·653	0·664	0·676	0·688											
·06	0·699	0·711	0·723	0·734	0·746	0·758	0·769	0·781	0·793	0·804	·408	7·922	7·929	7·936	7·943	7·949	7·956	7·963	7·970	7·977	7·984
·07	0·816	0·827	0·839	0·851	0·863	0·874	0·886	0·898	0·910	0·922	·407	7·991	7·998	8·005	8·012	8·018	8·025	8·032	8·038	8·044	8·050
·08	0·934	0·946	0·958	0·970	0·982	0·994	1·006	1·018	1·030	1·042	·406	8·055	8·060	8·065	8·069	8·074	8·079	8·084	8·089	8·094	8·099
·09	1·054	1·066	1·078	1·090	1·102	1·114	1·126	1·138	1·150	1·162	·405	8·104	8·109	8·114	8·119	8·123	8·128	8·133	8·138	8·143	8·148
·10	1·174	1·186	1·198	1·210	1·222	1·234	1·246	1·257	1·269	1·281	·404	8·153	8·157	8·162	8·167	8·172	8·177	8·182	8·187	8·192	8·197
·11	1·293	1·305	1·317	1·329	1·341	1·353	1·365	1·377	1·389	1·401	·403	8·202	8·206	8·211	8·216	8·221	8·226	8·231	8·236	8·241	8·246
·12	1·413	1·425	1·437	1·449	1·461	1·473	1·485	1·498	1·510	1·523	·402	8·250	8·255	8·260	8·265	8·270	8·275	8·280	8·285	8·290	8·295
·13	1·535	1·548	1·560	1·573	1·585	1·598	1·610	1·623	1·635	1·648	·401	8·300	8·305	8·309	8·314	8·319	8·324	8·329	8·334	8·339	8·344
·14	1·660	1·673	1·685	1·698	1·710	1·723	1·735	1·748	1·760	1·773	·400	8·349	8·354	8·358	8·364	8·367	8·371	8·375	8·379	8·383	8·387
·15	1·785	1·797	1·810	1·822	1·835	1·847	1·860	1·872	1·885	1·897	·39	8·425	8·464	8·502	8·540	8·578	8·613	8·648	8·681	8·712	8·740
·16	1·910	1·922	1·935	1·947	1·960	1·972	1·985	1·997	2·010	2·022	·38	8·768	8·796	8·824	8·852	8·880	8·908	8·936	8·964	8·991	9·018
·17	2·035	2·047	2·060	2·072	2·085	2·097	2·110	2·122	2·135	2·147	·37	9·045	9·071	9·097	9·123	9·149	9·175	9·201	9·227	9·253	9·279
·18	2·160	2·172	2·185	2·197	2·210	2·223	2·236	2·249	2·262	2·275	·36	9·305	9·330	9·353	9·373	9·394	9·414	9·434	9·454	9·474	9·494
·19	2·288	2·301	2·314	2·327	2·340	2·353	2·366	2·379	2·392	2·405	·35	9·514	9·534	9·553	9·573	9·592	9·610	9·628	9·646	9·664	9·682
·20	2·418	2·431	2·442	2·457	2·470	2·483	2·496	2·509	2·522	2·535	·34	9·700	9·718	9·736	9·754	9·771	9·789	9·808	9·824	9·841	9·859
·21	2·548	2·561	2·574	2·587	2·600	2·614	2·628	2·642	2·656	2·670	·33	9·877	9·894	9·911	9·928	9·945	9·962	9·979	9·996	10·013	10·030
·22	2·684	2·698	2·712	2·726	2·740	2·754	2·767	2·781	2·795	2·809	·32	10·047	10·064	10·081	10·098	10·115	10·132	10·149	10·166	10·182	10·198
·23	2·823	2·837	2·851	2·865	2·879	2·893	2·907	2·921	2·935	2·949	·31	10·214	10·230	10·246	10·262	10·278	10·294	10·310	10·326	10·342	10·357
·24	2·963	2·977	2·991	3·005	3·019	3·033	3·047	3·061	3·075	3·089	·30	10·372	10·387	10·402	10·417	10·432	10·447	10·462	10·477	10·492	10·507
·25	3·103	3·117	3·131	3·145	3·159	3·174	3·189	3·204	3·219	3·234	·29	10·521	10·536	10·551	10·565	10·579	10·593	10·607	10·621	10·635	10·649
·26	3·249	3·264	3·279	3·294	3·309	3·324	3·339	3·354	3·369	3·384	·28	10·663	10·677	10·691	10·705	10·719	10·733	10·747	10·761	10·775	10·788
·27	3·399	3·414	3·429	3·444	3·459	3·474	3·489	3·504	3·519	3·534	·27	10·801	10·814	10·827	10·840	10·853	10·866	10·879	10·892	10·905	10·918
·28	3·549	3·564	3·580	3·596	3·612	3·628	3·644	3·660	3·676	3·692	·26	10·931	10·944	10·957	10·970	10·983	10·996	11·009	11·022	11·035	11·048
·29	3·708	6·724	3·740	3·756	3·772	3·788	3·804	3·820	3·837	3·854	·25	11·061	11·074	11·087	11·100	11·113	11·126	11·138	11·150	11·162	11·174
·30	3·870	3·887	3·904	3·921	3·938	3·955	3·972	3·989	4·006	4·023	·24	11·186	11·198	11·210	11·222	11·234	11·246	11·258	11·270	11·282	11·294
·31	4·040	4·057	4·075	4·093	4·111	4·129	4·147	4·165	4·183	4·201	·23	11·306	11·318	11·330	11·342	11·354	11·366	11·378	11·390	11·402	11·414
·32	4·219	4·237	4·255	4·274	4·293	4·312	4·331	4·350	4·369	4·388	·22	11·426	11·438	11·450	11·462	11·473	11·485	11·497	11·509	11·521	11·533
·33	4·407	4·426	4·445	4·464	4·483	4·502	4·521	4·540	4·559	4·578	·21	11·545	11·557	11·569	11·581	11·593	11·605	11·616	11·627	11·638	11·649
·34	4·598	4·618	4·637	4·657	4·676	4·696	4·715	4·735	4·755	4·775	·20	11·660	11·671	11·682	11·693	11·704	11·715	11·726	11·737	11·748	11·759
·35	4·795	4·815	4·835	4·855	4·875	4·895	4·916	4·938	4·959	4·981	·19	11·770	11·781	11·792	11·803	11·814	11·825	11·836	11·847	11·858	11·869
·36	5·003	5·025	5·047	5·069	5·091	5·113	5·135	5·158	5·183	5·210	·18	11·880	11·891	11·902	11·913	11·924	11·935	11·946	11·956	11·967	11·977
·37	5·238	5·266	5·294	5·322	5·350	5·378	5·406	5·434	5·462	5·490	·17	11·988	11·998	12·009	12·020	12·030	12·040	12·051	12·061	12·071	12·082
·38	5·519	5·548	5·577	5·607	5·637	5·667	5·697	5·727	5·757	5·787	·16	12·093	12·103	12·114	12·124	12·135	12·145	12·156	12·166	12·177	12·187
·39	5·817	5·847	5·880	5·915	5·952	5·988	6·029	6·069	6·109	6·149	·15	12·198	12·208	12·219	12·229	12·240	12·250	12·261	12·271	12·282	12·292
·400	6·190	6·194	6·198	6·202	6·206	6·210	6·214	6·219	6·224	6·229	·14	12·302	12·313	12·323	12·334	12·344	12·355	12·365	12·376	12·386	12·397
·401	6·235	6·240	6·245	6·250	6·255	6·260	6·265	6·270	6·275	6·280	·13	12·407	12·418	12·428	12·439	12·449	12·460	12·470	12·481	12·491	12·502
·402	6·286	6·291	6·296	6·301	6·306	6·311	6·316	6·321	6·326	6·331	·12	12·512	12·523	12·533	12·544	12·554	12·564	12·574	12·584	12·594	12·604
·403	6·337	6·342	6·347	6·352	6·357	6·362	6·367	6·372	6·377	6·382	·11	12·614	12·624	12·634	12·644	12·654	12·664	12·674	12·684	12·694	12·704
·404	6·388	6·393	6·398	6·403	6·408	6·413	6·418	6·423	6·428	6·433	·10	12·714	12·724	12·734	12·743	12·753	12·763	12·773	12·783	12·793	12·803
·405	6·439	6·444	6·449	6·454	6·459	6·464	6·470	6·475	6·480	6·485	·09	12·813	12·823	12·833	12·843	12·853	12·863	12·873	12·883	12·893	12·903
·406	6·491	6·495	6·501	6·506	6·511	6·516	6·521	6·526	6·531	6·536	·08	12·913	12·923	12·933	12·943	12·953	12·963	12·973	12·983	12·993	13·003
·407	6·542	6·548	6·554	6·560	6·567	6·574	6·581	6·588	6·595	6·602	·07	13·013	13·023	13·033	13·043	13·053	13·062	13·072	13·082	13·091	13·101
·408	6·610	6·617	6·624	6·631	6·638	6·645	6·652	6·659	6·666	6·673	·06	13·111	13·120	13·130	13·140	13·149	13·159	13·169	13·178	13·188	13·198
·409	6·681	6·688	6·695	6·702	6·709	6·716	6·723	6·733	6·743	6·753	·05	13·207	13·217	13·227	13·236	13·246	13·256	13·266	13·275	13·285	13·295
·410	6·764	6·775	6·786	6·797	6·808	6·819	6·830	6·841	6·852	6·863	·04	13·304	13·314	13·324	13·333	13·342	13·352	13·362	13·372	13·381	13·391
·411	6·875	6·886	6·897	6·908	6·919	6·930	6·941	6·952	6·963	6·974	·03	13·401	13·410	13·420	13·430	13·439	13·449	13·459	13·468	13·478	13·488
·412	6·986	6·997	7·015	7·050	7·086	7·122	7·158	7·194	7·230	7·266	·02	13·497	13·507	13·517	13·526	13·536	13·546	13·555	13·565	13·575	13·584
·413	7·303	...	...	...	...	...	...	...	...	...	·01	13·594	13·604	13·613	13·623	13·633	13·643	13·652	13·662	13·671	13·681
											·00	13·691	13·700	13·710	13·720	13·729	13·738	13·748	13·758	13·767	13·777

θ—EYE-TABLE FOR TITHÍS—(BRAHMA SIDDHÂNTA AND SIDDHANTA ŚIROMANI)—*continued.*

Moon's anomaly and equation of the centre expressed in days and fractions of a day.

Eqn. +	0	1	2	3	4	5	6	7	8	9	Eqn. +
				Moon's anomaly in days.							
·00	13·777	13·787	13·796	13·806	13·815	13·825	13·834	13·844	13·854	13·863	·413
·01	13·873	13·882	13·892	13·902	13·911	13·921	13·931	13·941	13·950	13·960	·412
·02	13·970	13·979	13·989	13·999	14·008	14·018	14·028	14·037	14·047	14·057	·411
·03	14·066	14·076	14·086	14·095	14·105	14·115	14·124	14·134	14·144	14·153	·410
·04	14·163	14·173	14·182	14·192	14·202	14·212	14·221	14·230	14·240	14·250	·409
·05	14·259	14·269	14·279	14·288	14·298	15·308	14·318	14·327	14·337	14·347	·408
·06	14·356	14·366	14·376	14·385	14·395	14·405	14·414	14·424	14·434	14·443	·407
·07	14·453	14·463	14·472	14·482	14·492	14·501	14·511	14·521	14·531	14·541	·406
·08	14·551	14·561	14·571	14·581	14·591	14·601	14·611	14·621	14·631	14·641	·405
·09	14·651	14·661	14·671	14·681	14·691	14·701	14·711	14·721	14·731	14·741	·404
·10	14·751	14·761	14·771	14·781	14·791	14·801	14·811	14·820	14·830	14·840	·403
·11	14·850	14·860	14·870	14·880	14·890	14·900	14·910	14·920	14·930	14·940	·402
·12	14·950	14·960	14·970	14·980	14·990	15·000	15·010	15·021	15·031	15·042	·401
·13	15·052	15·063	15·073	15·084	15·094	15·105	15·115	15·126	15·136	15·147	·400
·14	15·157	15·168	15·178	15·189	15·199	15·210	15·220	15·231	15·241	15·252	·39
·15	15·262	15·272	15·283	15·293	15·304	15·314	15·325	15·335	15·346	15·356	·38
·16	15·367	15·377	15·388	15·398	15·409	15·419	15·430	15·440	15·451	15·461	·37
·17	15·472	15·482	15·493	15·503	15·514	15·524	15·535	15·545	15·556	15·566	·36
·18	15·577	15·587	15·598	15·608	15·619	15·630	15·641	15·652	15·663	15·674	·35
·19	15·685	15·696	15·707	15·718	15·729	15·740	15·751	15·762	15·773	15·784	·34
·20	15·795	15·805	15·817	15·828	15·839	15·850	15·861	15·872	15·883	15·894	·33
·21	15·905	15·916	15·927	15·938	15·949	15·961	15·973	15·985	15·997	16·009	·32
·22	16·021	16·033	16·045	16·057	16·069	16·081	16·092	16·104	16·116	16·128	·31
·23	16·140	16·152	16·164	16·176	16·188	16·200	16·212	16·224	16·236	16·248	·30
·24	16·260	16·272	16·284	16·296	16·308	16·320	16·332	16·344	16·356	16·368	·29
·25	16·380	16·392	16·404	16·416	16·428	16·441	16·454	16·467	16·480	16·493	·28
·26	16·506	16·519	16·532	16·545	16·558	16·571	16·584	16·597	16·610	16·623	·27
·27	16·636	16·649	16·662	16·675	16·688	16·701	16·714	16·727	16·740	16·753	·26
·28	16·766	16·777	16·793	16·807	16·821	16·835	16·849	16·863	16·877	16·891	·25
·29	16·905	16·919	16·933	16·947	16·961	16·975	16·989	17·003	17·018	17·033	·24
·30	17·047	17·062	17·077	17·092	17·107	17·122	17·137	17·152	17·167	17·182	·23
·31	17·197	17·212	17·228	17·244	17·260	17·276	17·292	17·308	17·324	17·340	·22
·32	17·356	17·372	17·388	17·405	17·422	17·439	17·456	17·473	17·490	17·507	·21
·33	17·524	17·541	17·558	17·575	17·592	16·609	17·626	17·643	17·660	17·677	·20
·34	17·695	17·713	17·730	17·748	17·765	17·783	17·800	17·818	17·836	17·854	·19
·35	17·868	17·890	17·908	17·926	17·944	17·962	17·981	18·001	18·020	18·040	·18
·36	18·060	18·080	18·100	18·120	18·140	18·160	18·180	18·201	18·224	18·249	·17
·37	18·275	18·301	18·327	18·353	18·379	18·405	18·431	18·457	18·483	18·509	·16
·38	18·536	18·563	18·590	18·618	18·646	18·674	18·702	18·730	18·758	18·786	·15
·39	18·814	18·842	18·873	18·906	18·941	18·976	19·014	19·052	19·090	19·128	·14
·400	19·167	19·171	19·175	19·179	19·183	19·187	19·191	19·196	19·201	19·206	·13
·401	19·210	19·215	19·220	19·225	19·230	19·235	19·240	19·245	19·250	19·255	·12
·402	19·259	19·264	19·269	19·274	19·279	19·284	19·289	19·294	19·299	19·304	·11
·403	19·308	19·313	19·318	19·323	19·328	19·333	19·338	19·343	19·348	19·353	·10
·404	19·357	19·362	19·367	19·372	19·377	19·382	19·387	19·392	19·397	19·402	·09
·405	19·406	19·411	19·416	19·421	19·426	19·431	19·435	19·440	19·445	19·450	·08
·406	19·455	19·460	19·465	19·470	19·475	19·480	19·484	19·489	19·494	19·499	·07
·407	19·504	19·510	19·516	19·522	19·529	19·536	19·542	19·549	19·556	19·563	·06
·408	19·570	19·577	19·586	19·591	19·598	19·605	19·611	19·618	19·625	19·632	·05
·409	19·639	19·646	19·653	19·660	19·667	19·674	19·680	19·690	19·700	19·710	·04
·410	19·720	19·731	19·741	19·752	19·763	19·774	19·785	19·796	19·807	19·818	·03
·411	19·829	19·840	19·851	19·862	19·873	19·884	19·894	19·905	19·916	19·927	·02
·412	19·938	19·949	19·967	20·002	20·038	20·074	20·109	20·145	20·181	20·217	·01
·413	20·253	...	...	...	...	...	...	...	...	...	·00

Eqn. +	9	8	7	6	5	4	3	2	1	0
				Moon's anomaly in days.						
·413	...	...	...	...	...	...	...	...	...	20·253
·412	20·288	20·324	20·360	20·426	20·463	20·499	20·535	20·540	20·558	20·569
·411	20·580	20·591	20·602	20·613	20·625	20·636	20·647	20·658	20·669	20·680
·410	20·691	20·702	20·713	20·724	20·736	20·747	20·758	20·769	20·780	20·791
·409	20·801	20·811	20·821	20·831	20·839	20·849	20·853	20·860	20·867	20·874
·408	20·881	20·888	20·895	20·902	20·910	20·917	20·924	20·931	20·938	20·945
·407	20·952	20·959	20·966	20·973	20·981	20·988	20·995	21·001	21·007	21·013
·406	21·018	21·023	21·028	21·033	21·039	21·044	21·049	21·054	21·059	21·064
·405	21·069	21·074	21·079	21·085	21·090	21·095	21·100	21·105	21·110	21·115
·404	21·120	21·125	21·130	21·135	21·141	21·146	21·151	21·156	21·161	21·166
·403	21·171	21·176	21·181	21·186	21·192	21·197	21·202	21·207	21·212	21·217
·402	21·222	21·227	21·232	21·237	21·243	21·248	21·253	21·258	21·263	21·268
·401	21·273	21·278	21·283	21·288	21·294	21·299	21·304	21·309	21·314	21·319
·400	21·324	21·329	21·334	21·339	21·344	21·348	21·352	21·356	21·360	21·364
·39	21·404	21·445	21·485	21·525	21·565	21·602	21·639	21·674	21·707	21·737
·38	21·767	21·797	21·827	21·857	21·887	21·917	21·947	21·977	22·006	22·035
·37	22·064	22·092	22·120	22·148	22·176	22·204	22·232	22·260	22·288	22·316
·36	22·344	22·371	22·396	22·419	22·441	28·463	22·485	22·507	12·529	22·557
·35	22·573	22·595	22·616	22·638	22·659	22·679	22·699	22·719	22·739	22·759
·34	22·779	22·799	22·819	22·839	22·858	22·878	22·897	22·917	22·936	22·956
·33	22·976	22·995	23·014	23·033	23·052	23·071	23·090	23·109	23·128	23·147
·32	23·166	23·185	23·204	23·223	23·242	23·261	23·280	23·299	23·317	23·335
·31	23·353	23·371	23·389	23·407	23·425	23·443	23·461	23·479	23·497	23·514
·30	23·531	23·548	23·565	23·582	23·599	23·616	23·633	23·650	23·667	23·684
·29	23·700	23·717	23·734	23·750	23·766	23·782	23·798	23·814	23·830	23·846
·28	23·862	23·878	23·894	23·910	23·926	23·942	23·958	23·974	23·990	24·005
·27	24·020	24·035	24·050	24·065	24·080	24·095	24·110	24·125	24·140	24·155
·26	24·170	24·185	24·200	24·215	24·230	24·255	24·260	24·275	24·290	24·305
·25	24·320	24·335	24·350	24·365	24·380	24·395	24·409	24·423	24·437	24·451
·24	24·465	24·479	24·493	24·507	24·521	24·535	24·549	24·563	24·577	24·591
·23	24·605	24·619	24·633	24·647	24·661	24·675	24·689	24·703	24·717	24·731
·22	24·745	24·759	24·773	24·787	24·801	24·814	24·828	24·842	24·856	24·870
·21	24·884	24·898	24·912	24·926	24·940	24·954	24·968	24·980	24·993	25·006
·20	25·019	25·032	25·045	25·058	25·071	25·084	25·097	25·110	25·123	25·136
·19	25·149	25·162	25·175	25·188	25·201	25·214	25·227	25·240	25·253	25·266
·18	25·279	25·292	25·305	25·318	25·331	25·344	25·357	25·369	25·382	25·394
·17	25·407	25·419	25·432	25·445	25·457	25·469	25·482	25·494	25·507	25·519
·16	25·532	25·544	25·557	25·569	25·582	25·594	25·607	25·619	25·632	25·644
·15	25·657	25·669	25·682	25·694	25·707	25·719	25·732	25·744	25·757	25·769
·14	25·781	25·794	25·806	25·819	25·831	25·844	25·856	25·869	25·881	25·894
·13	25·906	25·919	25·931	25·944	25·956	25·969	25·981	25·994	26·000	26·019
·12	26·031	26·044	26·056	26·069	26·081	26·093	26·105	26·117	26·129	26·141
·11	26·153	26·165	26·177	26·189	26·201	26·213	26·225	26·237	26·249	26·261
·10	26·273	26·285	26·297	26·308	26·320	26·332	26·344	26·356	26·368	26·380
·09	26·392	26·404	26·416	26·428	26·440	26·452	26·464	26·476	26·488	26·500
·08	26·512	26·524	26·536	26·548	26·560	26·572	26·584	26·596	26·608	26·620
·07	26·632	26·644	26·656	26·668	26·680	26·691	26·703	26·715	26·726	26·738
·06	26·750	26·761	26·773	26·785	26·796	26·808	26·820	26·831	26·843	26·855
·05	26·866	26·878	26·890	26·901	26·913	26·925	26·937	26·948	26·960	26·972
·04	26·983	26·995	27·007	27·018	27·029	27·041	27·053	27·065	27·076	27·088
·03	27·100	27·111	27·123	27·135	27·146	27·158	27·170	27·181	27·193	27·205
·02	27·216	27·228	27·240	27·251	27·263	27·275	27·286	27·298	27·310	27·321
·01	27·333	27·345	27·356	27·368	27·380	27·392	27·403	27·415	27·427	27·438
·00	27·450	27·461	27·473	27·485	27·496	27·507	27·519	27·531	27·542	27·554

f—BYE-TABLE FOR NAKSHATRAS.

Moon's anomaly and moon's equation of the centre in days and fractions of a day.

(BRAHMA SIDDHĀNTA AND SIDDHĀNTA ŚIROMAṆI.)

Eqn.	0	1	2	3	4	5	6	7	8	9
–	Moon's anomaly in days.									
·00	0·000	0·012	0·025	0·037	0·050	0·062	0·075	0·087	0·100	0·112
·01	0·125	0·137	0·150	0·162	0·175	0·187	0·200	0·212	0·225	0·237
·02	0·250	0·262	0·275	0·287	0·300	0·312	0·325	0·337	0·350	0·362
·03	0·375	0·387	0·400	0·412	0·425	0·437	0·450	0·462	0·475	0·487
·04	0·499	0·512	0·524	0·537	0·549	0·562	0·574	0·587	0·599	0·612
·05	0·624	0·637	0·649	0·662	0·674	0·687	0·699	0 712	0·726	0·737
·06	0·749	0·762	0·774	0·787	0·799	0·812	0·824	0·837	0·849	0·862
·07	0·874	0·887	0·899	0·912	0·924	0·937	0·950	0·963	0·976	0·989
·08	1·002	1·015	1·028	1·041	1·054	1·067	1·080	1·093	1·106	1·119
·09	1·132	1·145	1·158	1·171	1·184	1·197	1·210	1·223	1·236	1·249
·10	1·262	1·275	1·288	1·301	1·314	1·327	1·340	1·353	1·366	1·379
·11	1·392	1·405	1·418	1·431	1·444	1·457	1·470	1·483	1·496	1·509
·12	1·522	1·535	1·548	1·561	1·575	1·588	1·601	1·615	1·628	1·642
·13	1·655	1·669	1·682	1·694	1·708	1·722	1·736	1·749	1·763	1·776
·14	1·789	1·802	1·816	1·829	1·842	1·856	1·869	1·883	1·896	1·910
·15	1·923	1·937	1·950	1·964	1·978	1·991	2·005	2·018	2·032	2·045
·16	2·059	2·072	2·086	2·099	2·112	2·126	2·139	2·153	2·166	2·180
·17	2·193	2·207	2·221	2·234	2·248	2·262	2·276	2·291	2·305	2·318
·18	2·332	2·346	2·360	2·374	2·388	2·402	2·416	2·430	2·444	2·458
·19	2·472	2·486	2·500	2·514	2·528	2·542	2·555	2·570	2·584	2·598
·20	2·613	2·628	2·643	2·658	2·673	2·688	2·703	2·718	2·734	2·748
·21	2·763	2·779	2·794	2·809	2·823	2·838	2·853	2·868	2·883	2·898
·22	2·912	2·928	2·943	2·958	2·973	2·988	2·003	3·018	3·034	3·049
·23	3·065	3·080	3·096	3·111	3·127	3·142	3·158	3·173	3·189	3·204
·24	3·220	3·235	3·251	3·266	3·282	3·298	3·314	3·331	3·348	3·365
·25	3·381	3·397	3·413	3·429	3·445	3·461	3·477	3·493	3·509	3·525
·26	3·541	3·558	3·576	3·593	3·610	3·627	3·644	3·661	3·678	3·695
·27	3·713	3·731	3·749	3·767	3·784	3·802	3 819	3·837	3·854	3·871
·28	3·889	3·906	3·924	3·942	3·961	3·980	3·999	4·018	4·037	4·056
·29	4·075	4·094	4·113	4·131	4·150	4·169	4·188	4·208	4·229	4·248
·30	4·269	4·289	4·310	4·330	4·351	4·371	4·392	4·413	4·434	4·455
·31	4·476	4·497	4·518	4·539	4·560	4·581	4·602	4·623	4·644	4·665
·32	4·686	4·707	4·729	4·751	4·773	4·795	4·817	4·839	4·861	4·883
·33	4·905	4·927	4·950	4·973	4·996	5·020	5·041	5·068	5·092	5·117
·34	5·148	5·180	5·211	5·243	5·274	5.306	5·337	5·369	5·401	5·433
·35	5·465	5·497	5·529	5·561	5·593	5·625	5·657	5·689	5·722	5·756
·36	5·790	5·825	5·862	5·899	5·936	5 973	6·010	6·047	6·084	6·121
·370	6·158	6·163	6·168	6·173	6·178	6·183	6·189	6·194	6·199	6·204
·371	6·209	6·214	6 219	6·225	6·229	6 234	6·239	6·244	6·249	6·254
·372	6·259	6·264	6·270	6·276	6·282	6·287	6 293	6·299	6·305	6·311
·373	6·317	6·323	6·329	6·335	6·341	6·346	6·352	6·357	6·363	6 368
·374	6·373	6·379	6·384	6·390	6·395	6·400	6·407	6·412	6·418	6·423
·375	6·429	6·434	6·439	6·445	6·451	6·456	6·462	6·467	6·473	6·478
·376	6 483	6·489	6·494	6·500	6·505	6·511	6·518	6·524	6·531	6·538
·277	6·545	6·552	6·560	6·567	6·575	6·583	6·593	6·601	6·609	6·617
·378	6·625	6·633	6·640	6·648	6·656	6·663	6·671	6·678	6·685	6·692
·379	6·702	6·713	6·725	6·736	6·748	6·760	6·773	6·784	6·796	6·808
·380	6·821	6·833	6·845	6·857	6·869	6·881	6·894	6·906	6·918	6·931
·381	6·944	6·957	6·970	6·985	7·015	7·051	7·088	7·124	7·160	7·196
·382	7·232	7·268	...	...	...	...	...	...	...	...

Eqn.	9	8	7	6	5	4	3	2	1	0
–	Moon's anomaly in days.									
·382									7·273	7·309
·381	7·345	7·381	7·417	7·450	7·488	7·524	7·555	7·569	7·582	7·595
·380	7·608	7·621	7 633	7·645	7·656	7·668	7·680	7·692	7·704	7·716
·379	7·729	7·741	7·753	7·764	7·775	7·787	7·799	7·810	7·822	7·833
·378	7·843	7·850	7·857	7·864	7·870	7·874	7·885	7·893	7·900	7·908
·377	7·916	7·924	7·932	7·940	7·948	7·956	7·964	7·971	7·979	7·986
·376	7·993	8·000	8·006	8·012	8·017	8·023	8·028	8·034	8·039	8·045
·375	8·050	8·055	8·061	8·066	8·070	8·075	8·081	8·087	8·092	8·097
·374	8·103	8·108	8·114	8·119	8·124	8·129	8·134	8·140	8·145	8·151
·373	8·156	8·161	8·167	8·172	8·176	8·181	8·187	8·193	8·199	8·205
·372	8·211	8·217	8·223	8·229	8·235	8·238	8·243	8·248	8·254	8·259
·371	8·264	8·269	8·274	8·279	8·284	8·289	8·294	8·299	8·304	8·309
·370	8·314	8·319	8·324	8·329	8·333	8·338	8·343	8·348	8·353	8·358
·36	8·393	8·428	8·463	8·498	8·533	8·568	8·603	8·658	8·675	8·708
·35	8·740	8·772	8·803	8·833	8·863	8·893	8·923	8·953	8·983	9·013
·34	9·043	9·073	9·103	9·133	9·162	9·192	9·221	9·251	9·280	9·310
·33	9·339	9·362	9·384	9·406	9·428	9·450	9·471	9·492	9·513	9·583
·32	9·553	9·573	9·593	9·613	9·633	9·653	9·673	9·693	9·713	9·732
·31	9·751	9·770	9·789	9·808	9·827	9·846	9·865	9·884	9·903	9·922
·30	9·941	9·960	9·979	9·998	10·017	10·035	10·054	10·072	10·091	10·109
·29	10·128	10·146	10 165	10·183	10 200	10·217	10·234	10·250	10 267	10 284
·28	10·301	10·318	10·335	10·352	10·369	10·386	10·403	10 419	10·435	10·450
·27	10·466	10·481	10·496	10·512	10·527	10·543	10·560	10 574	10·590	10·606
·26	10·622	10·637	10·652	10·667	10·632	10·697	10·712	10·725	10·741	10·756
·25	10·770	10·784	10·798	10 812	10·826	10·840	10 854	10·868	10 882	10·896
·24	10·910	10·925	10·940	10·955	10·969	10·983	10·997	11·010	11·024	11·037
·23	11·051	11·064	11·078	11·091	11·105	11·118	11·132	11·145	11·159	11·172
·22	11·186	11·199	11·213	11·226	11·239	11·252	11·265	11·278	11·291	11·305
·21	11·318	11·330	11·343	11·356	11·369	11·382	11·395	11·408	11·421	11·434
·20	11·447	11·460	11·473	11·486	11 499	11·512	11·525	11·538	11·551	11·564
·19	11·577	11·588	11·601	11·614	11·625	11·637	11·649	11·661	11·673	11·685
·18	11·697	11·709	11·720	11·733	11·745	11·757	11·769	11·781	11·793	11·805
·17	11·817	11·828	11·840	11·853	11·865	11·877	11·889	11·900	11·912	11·924
·16	11·935	11·947	11·959	11·971	11·982	11·994	12·005	12·016	12·028	12·039
·15	12·051	12·062	12·074	12·085	12·097	12·108	12·120	12 132	12·143	12·155
·14	12·166	12·178	12·189	12·201	12·213	12·225	12 236	12·247	12·259	12·270
·13	12·281	12·292	12·304	12·315	12·327	12·338	12·349	12·361	12·372	12·384
·12	12·395	12·407	12·418	12·430	12·441	12·452	12·464	12 475	12·486	12 497
·11	12·508	12·519	12·530	12·541	12·552	12·563	12·574	12·585	12·596	12·607
·10	12·618	12·629	12·640	12·651	12·662	12·673	12·684	12·695	12·706	12·717
·09	12·728	12·739	12·750	12 761	12·772	12·783	12·794	12·805	12·816	12·827
·08	12·838	12·849	12·860	12·871	12·882	12 893	12·904	12·915	12·926	12·937
·07	12·948	12·959	12·970	12·981	12·992	13·003	13·013	13·024	13·034	13·045
·06	13·055	13·066	13·076	13·087	13·097	13·108	13·118	13·129	13·139	13·150
·05	13·160	13·171	13·181	13·192	13·202	13·213	13·223	13·234	13·244	13·255
·04	13·265	13·276	13·286	13·297	13·307	13·318	13·328	13·339	13·349	13·360
·03	13·370	13·380	13·391	13·401	13·412	13·422	13·433	13·443	13·454	13·464
·02	13·475	13·485	13·496	13·506	13·517	13·527	13 538	13·548	13·559	13·569
·01	13·580	13·590	13·600	13·610	13·620	13·630	13·641	13·651	13·662	13·672
·00	13·683	13·693	13·704	13·714	13·725	13·735	13·746	13·756	13·767	13·777

f—EYE-TABLE FOR NAKSHATRAS—*continued.*

Moon's anomaly and moon's equation of the centre in days and fractions of a day.

(BRAHMA SIDDHĀNTA AND SIDDHĀNTA ŚIROMANI.)

Eqn. +	0	1	2	3	4	5	6	7	8	9
					Moon's anomaly in days.					
·00	13·777	13·787	13·798	13·808	13·819	13·829	13·840	13·850	13·861	13·871
·01	13·882	13·892	13·903	13·913	13·924	13·934	13·944	13·954	13·964	13·974
·02	13·985	13·995	14·006	14·016	14·027	14·037	14·048	14·058	14·069	14·079
·03	14·090	14·100	14·111	14·121	14·132	14·142	14·153	14·163	14·174	14·184
·04	14·194	14·205	14·215	14·226	14·236	14·247	14·257	14·268	14·278	14·289
·05	14·299	14·310	14·320	14·331	14·341	14·352	14·362	14·373	14·383	14·394
·06	14·404	14·415	14·426	14·437	14·447	14·458	14·468	14·479	14·489	14·500
·07	14·510	14·521	14·531	14·542	14·552	14·563	14·574	14·585	14·596	14·607
·08	14·618	14·629	14·640	14·651	14·662	14·673	14·684	14·695	14·706	14·717
·09	14·728	14·739	14·750	14·761	14·772	14·783	14·794	14·805	14·816	14·827
·10	14·838	14·849	14·860	14·871	14·882	14·893	14·904	14·915	14·926	14·937
·11	14·948	14·959	14·970	14·981	14·992	15·003	15·014	15·025	15·036	15·047
·12	15·059	15·070	15·081	15·092	15·104	15·115	15·126	15·138	15·149	15·161
·13	15·172	15·184	15·195	15·207	15·218	15·229	15·241	15·252	15·264	15·275
·14	15·286	15·297	15·309	15·320	15·331	15·343	15·354	15·366	15·377	15·389
·15	15·400	15·412	15·423	15·435	15·447	15·458	15·470	15·481	15·493	15·504
·16	15·516	15·527	15·539	15·550	15·561	15·573	15·584	15·596	15·607	15·619
·17	15·630	15·642	15·654	15·665	15·677	15·689	15·701	15·714	15·726	15·737
·18	15·749	15·761	15·773	15·785	15·797	15·809	15·821	15·833	15·845	15·857
·19	15·869	15·881	15·893	15·905	15·917	15·929	15·940	15·953	15·966	15·977
·20	15·990	16·003	16·016	16·029	16·042	16·055	16·068	16·081	16·094	16·107
·21	16·120	16·134	16·147	16·160	16·173	16·186	16·199	16·212	16·225	16·237
·22	16·250	16·264	16·277	16·290	16·303	16·316	16·329	16·342	16·356	16·369
·23	16·383	16·396	16·410	16·423	16·437	16·450	16·464	16·477	16·491	16·504
·24	16·518	16·531	16·545	16·558	16·572	16·586	16·600	16·615	16·630	16·645
·25	16·659	16·673	16·687	16·701	16·715	16·729	16·743	16·757	16·771	16·785
·26	16·799	16·814	16·830	16·845	16·860	16·875	16·890	16·905	16·920	16·935
·27	16·949	16·967	16·983	16·999	17·014	17·030	17·045	17·061	17·076	17·091
·28	17·107	17·122	17·138	17·154	17·171	17·188	17·205	17·222	17·239	17·255
·29	17·273	17·290	17·307	17·323	17·340	17·357	17·374	17·392	17·411	17·428
·30	17·447	17·465	17·484	17·502	17·521	17·539	17·558	17·577	17·596	17·615
·31	17·634	17·653	17·672	17·691	17·710	17·729	17·748	17·767	17·786	17·805
·32	17·824	17·843	17·863	17·883	17·903	17·923	17·943	17·963	17·983	18·003
·33	18·023	18·043	18·064	18·085	18·106	18·127	18·149	18·171	18·193	18·216
·34	18·245	18·275	18·304	18·334	18·363	18·393	18·422	18·452	18·482	18·512
·35	18·542	18·572	18·602	18·632	18·662	18·692	18·722	18·752	18·783	18·815
·36	18·847	18·880	18·915	18·950	18·985	19·020	19·055	19·090	19·125	19·160
·370	19·195	19·200	19·205	19·210	19·215	19·220	19·224	19·229	19·234	19·239
·371	19·244	19·249	19·254	19·259	19·264	19·269	19·274	19·279	19·284	19·289
·372	19·294	19·299	19·304	19·309	19·315	19·320	19·324	19·330	19·336	19·342
·373	19·348	19·354	19·360	19·366	19·372	19·377	19·381	19·386	19·392	19·397
·374	19·402	19·408	19·413	19·419	19·424	19·429	19·434	19·439	19·445	19·450
·375	19·456	19·461	19·466	19·472	19·478	19·483	19·487	19·492	19·498	19·503
·376	19·508	19·514	19·519	19·525	19·530	19·536	19·541	19·547	19·554	19·561
·377	19·568	19·575	19·583	19·590	19·598	19·606	19·614	19·622	19·630	19·638
·378	19·646	19·654	19·661	19·669	19·677	19·684	19·690	19·697	19·704	19·711
·379	19·721	19·732	19·744	19·755	19·767	19·779	19·790	19·801	19·813	19·825
·380	19·838	19·850	19·862	19·874	19·886	19·898	19·909	19·921	19·933	19·946
·381	19·959	19·972	19·985	20·000	20·030	20·066	20·101	20·137	20·167	20·209
382	20·245	20·281	...	...	...	...	...	...	...	...

Eqn. +	9	8	7	6	5	4	3	2	1	0
	Moon's anomaly in days.									
·382	...	...	...	...	...	...	...	...	20·286	20·322
·381	20·358	20·394	20·430	20·463	20·503	20·539	20·570	20·584	20·597	20·610
·380	20·623	20·636	20·648	20·660	20·673	20·685	20·697	20·709	20·721	20·733
·379	20·746	20·758	20·770	20·781	20·794	20·806	20·818	20·829	20·841	20·852
·378	20·862	20·869	20·876	20·883	20·891	20·898	20·906	20·914	20·921	20·929
·377	20·937	20·945	20·953	20·961	20·971	20·979	20·987	20·994	21·002	21·009
·376	21·016	21·023	21·029	21·035	21·042	21·048	21·053	21·059	21·064	21·070
·375	21·075	21·080	21·086	21·091	21·097	21·102	21·108	21·114	21·119	21·124
·374	21·130	21·135	21·141	21·146	21·153	21·158	21·163	21·169	21·174	21·180
·373	21·185	21·190	21·196	21·201	21·207	21·212	21·218	21·224	21·230	21·236
·372	21·242	21·248	21·254	21·260	21·266	21·271	21·277	21·283	21·289	21·294
·371	21·299	21·304	21·309	21·314	21·319	21·324	21·329	21·334	21·339	21·344
·370	21·349	21·354	21·359	21·364	21·370	21·375	21·380	21·385	21·390	21·395
·36	21·432	21·469	21·506	21·543	21·580	21·617	21·654	21·691	21·730	21·765
·35	21·799	21·833	21·866	21·898	21·930	21·962	21·994	22·026	22·048	22·090
·34	22·122	22·154	22·186	22·218	22·249	22·281	22·312	22·344	22·375	22·407
·33	22·438	22·463	22·487	22·511	22·535	22·559	22·582	22·605	22·628	22·650
·32	22·672	22·694	22·716	22·738	22·760	22·782	22·804	22·826	22·848	22·869
·31	22·890	22·911	22·932	22·953	22·974	22·995	23·016	23·037	23·058	23·079
·30	23·100	23·121	23·142	23·163	23·184	23·204	23·225	23·245	23·266	23·286
·29	23·307	23·327	23·348	23·368	23·387	23·406	23·425	23·443	23·462	23·481
·28	23·500	23·519	23·538	23·557	23·576	23·595	23·614	23·632	23·650	23·667
·27	23·685	23·702	23·719	23·733	23·754	23·772	23·791	23·807	23·825	23·842
·26	23·861	23·878	23·895	23·912	23·929	23·946	23·963	23·978	23·996	24·013
·25	24·029	24·045	24·061	24·077	24·093	24·109	24·125	24·141	24·157	24·173
·24	24·189	24·206	24·223	24·240	24·256	24·272	24·288	24·303	24·319	24·334
·23	24·350	24·365	24·381	24·396	24·412	24·427	24·443	24·458	24·474	24·489
·22	24·505	24·520	24·536	24·551	24·566	24·581	24·596	24·611	24·626	24·642
·21	24·657	24·671	24·686	24·701	24·716	24·731	24·746	24·761	24·776	24·791
·20	24·806	24·821	24·836	24·851	24·866	24·881	24·897	24·911	24·926	24·941
·19	24·956	24·969	24·984	24·999	25·012	25·026	25·040	25·054	25·068	25·082
·18	25·096	25·110	25·123	25·138	25·152	25·166	25·180	25·195	25·208	25·222
·17	25·236	25·249	25·263	25·278	25·292	25·306	25·320	25·333	25·347	25·361
·16	25·374	25·388	25·402	25·416	25·429	25·443	25·456	25·469	25·483	25·496
·15	25·510	25·523	25·537	25·550	25·564	25·577	25·591	25·605	25·618	25·632
·14	25·645	25·659	25·672	25·686	25·700	25·714	25·727	25·740	25·754	25·767
·13	25·780	25·793	25·807	25·820	25·834	25·847	25·860	25·874	25·887	25·901
·12	25·914	25·928	25·941	25·955	25·968	25·981	25·995	26·008	26·021	26·034
·11	26·047	26·060	26·073	26·086	26·099	26·112	26·125	26·138	26·151	26·164
·10	26·177	26·190	26·203	26·216	26·229	26·242	26·255	26·268	26·281	26·294
·09	26·307	26·320	26·333	26·346	26·359	26·372	26·385	26·398	26·411	26·424
·08	26·437	26·450	26·463	26·476	26·489	26·502	26·515	26·528	26·539	26·554
·07	26·567	26·580	26·593	26·606	26·619	26·632	26·644	26·657	26·669	26·682
·06	26·694	26·707	26·719	26·732	26·744	26·757	26·769	26·782	26·794	26·807
·05	26·819	26·832	26·844	26·857	26·869	26·882	26·894	26·907	26·919	26·932
·04	26·944	26·957	26·969	26·982	26·994	27·007	27·019	27·032	27·044	27·057
·03	27·069	27·081	27·094	24·106	27·119	27·131	27·144	27·156	27·169	27·181
·02	27·194	27·206	27·219	27·231	27·244	27·256	27·269	27·281	27·294	27·306
·01	27·319	27·331	27·343	27·355	27·367	27·379	27·392	27·404	27·417	27·429
·00	27·442	27·454	27·467	27·479	27·492	27·504	27·517	27·529	27·542	27·554

g—EYE-TABLE FOR YOGAS.

Moon's anomaly and equation of the centre expressed in days and fractions of a day.

(BRAHMA SIDDHĀNTA AND SIDDHĀNTA ŚIROMAṆI.)

Eqn.	0	1	2	3	4	5	6	7	8	9	Eqn.	9	8	7	6	5	4	3	2	1	0
—	Moon's anomaly in days.										—	Moon's anomaly in days.									
·00	0·000	0·014	0·028	0·041	0·054	0·067	0·080	0·093	0·106	0·120	·35	...	...	...	...	7·245	7·411	7·570	7·709	7·848	7·987
·01	0·132	0·146	0·159	0·173	0·187	0·200	0·213	0·226	0·240	0·254	·34	8·081	8·130	8·179	8·228	8·277	8·326	8 370	8·414	8·458	8 502
·02	0·267	0·280	0·294	0·307	0·320	0·334	0·347	0·361	0·374	0·387	·33	8·546	8·590	8·634	8·669	8·704	8·719	8·754	8·789	8·824	8·859
·03	0·401	0·414	0·428	0·441	0·454	0·468	0·481	0·495	0·508	0·522	·32	8·894	8·929	8·964	8·999	9·032	9·061	9·090	9 119	9·148	9·177
·04	0·535	0·547	0·561	0·575	0·588	0·602	0·614	0·628	0·642	0·656	·31	9·206	9·230	9·254	9·278	9·302	9·326	9·350	9·378	9·398	9·422
·05	0·669	0·682	0·695	0·709	0·722	0·735	0·749	0·762	0·776	0·789	·30	9·446	9·470	9·493	9·516	9·539	9·562	9·585	9·608	9·631	9·654
·06	0·802	0·816	0·829	0·843	0·856	0·869	0·883	0·896	0·910	0·924	·29	9·676	9·698	9·719	9·741	9·762	9·783	9·804	9·825	9·847	9·869
·07	0·938	0·952	0·965	0·979	0·993	1·007	1·021	1·034	1·048	1·062	·28	9·890	9·911	9·932	9·953	9·973	9·993	10·013	10·033	10·054	10·073
·08	1·075	1·090	1·103	1·117	1·131	1·144	1·158	1·172	1·186	1·200	·27	10·092	10·111	10·130	10·149	10·168	10·187	10·206	10·225	10·244	10·262
·09	1·213	1·227	1·241	1·254	1·268	1·282	1·295	1·309	1·323	1·337	·26	10·280	10·298	10·316	10·334	10·352	10·368	10·385	10·403	10·421	10·439
·10	1·351	1·364	1·378	1·391	1·405	1·419	1·433	1·447	1·461	1·474	·25	10·457	10·473	10·490	10·506	10·524	10·541	10·558	10·574	10·590	10·607
·11	1·488	1·502	1·516	1·530	1·544	1·558	1·572	1·587	1·602	1·617	·24	10·624	10·641	10·657	10·672	10·688	10·704	10·719	10·735	10·751	10·767
·12	1·632	1·647	1·661	1·675	1·690	1·705	1·719	1·733	1·747	1·761	·23	10·782	10·797	10·813	10·829	10·845	10·861	10·877	10·893	10·909	10·924
·13	1·776	1·791	1·805	1·819	1·833	1·847	1·862	1·876	1·891	1·905	22	10·940	10·955	10 970	10·985	11·000	11·015	11·030	11·045	11·059	11·073
·14	1·919	1·933	1·948	1·963	1·978	1·992	2·006	2·020	2·034	2·049	·21	11·087	11·101	11·115	11·129	11·143	11·157	11·171	11·185	11·200	11·215
·15	2·063	2·077	2·092	2·106	2·120	2·135	2·149	2·164	2·178	2·192	·20	11·229	11·243	11·257	11·271	11·285	11·299	11·314	11·328	11·343	11·358
·16	2·207	2·222	2·237	2·252	2·267	2·282	2·297	2·312	2·327	2·342	·19	11·373	11·387	11·401	11·415	11·429	11·443	11·457	11·471	11·485	11·499
·17	2·357	2·371	2·386	2·401	2·416	2 431	2·446	2·461	2·476	2·490	·18	11·513	11·527	11·541	11·554	11·567	11·580	11·593	11·606	11·619	11·632
·18	2·505	2·520	2·535	2·550	2·565	2·580	2·595	2·610	2·626	2·642	·17	11·635	11·657	11·670	11·683	11·696	11·709	11·722	11·735	11·748	11·760
·19	2·658	2·674	2·690	2·706	2·722	2·738	2·754	2·770	2·786	2·802	·16	11·773	11·786	11·799	11·812	11·825	11·838	11·851	11·864	11·877	11·890
·20	2·819	2·836	2·853	2·869	2·886	2·902	2·918	2·934	2·950	2·966	·15	11·903	11·915	11 927	11·940	11·952	11·965	11·977	11·989	12·002	12·014
·21	2·982	2·999	3·016	3·032	3·048	3·064	3·080	3·096	3·112	3·128	·14	12·026	12·039	12·051	12·063	12·075	12·087	12·100	12·113	12·126	12·138
·22	3·144	3·160	3·176	3·193	3·210	3·227	3·244	3·261	3·278	3·295	·13	12·150	12·162	12·175	12·187	12·200	12·212	12·224	12·236	12·248	12·261
·23	3·313	3·330	3·348	3·366	3·384	3·402	3·420	3·438	3·456	3·473	·12	12·274	12·286	12·298	12·310	12·322	12·335	12·348	12·360	12·372	12·385
·24	3·490	3·508	3·526	3·544	3·561	3·579	3·597	3·614	3·632	3·651	·11	12·398	12·411	12 424	12·437	12·449	12·461	12·473	12·485	12·497	12 509
·25	3·670	3·689	3·707	3·725	3·744	3·763	3·783	3·801	3·820	3·838	·10	12·521	12·532	12·544	12·556	12·568	12·580	12·592	12·603	12·615	12·626
·26	3·858	3·878	3·898	3·918	3·937	3·955	3·975	3·995	4·015	4·035	·09	12·638	12·650	12·662	12·674	12·685	12·697	12·709	12·720	12·732	12·744
·27	4·055	4·075	4·096	4·117	4·138	4·159	4·180	4·201	4·222	4·243	·08	12·755	12·767	12·779	12·791	12·803	12·814	12·826	12·838	12·850	12·862
·28	4·264	4·285	4·308	4·330	4·352	4·374	4·396	4·419	4·442	4·465	07	12·873	12·885	12·897	12·908	12·920	12·932	12·944	12·956	12·967	12·979
·29	4·488	4·512	4·536	4·559	4·582	4·605	4·628	4·652	4·675	4·699	·06	12·991	13·003	12·015	12·026	13·038	13·049	13·060	13·072	13·083	13·095
·30	4·723	4·748	4·773	4·798	4·823	4·848	4·873	4·898	4·923	4·949	·05	13·106	13·117	13·129	13·140	13·152	13·163	13·174	13·186	13·197	13·208
·31	4·975	5·001	5·026	5·053	5·079	5·105	5·131	5·157	5·183	5·209	·04	13·219	13·231	13·243	13·255	13·265	13·277	13·288	13·300	13·312	13·322
·32	5·240	5·271	5·302	5·333	5·364	5·395	5·430	5·467	5 504	5·541	·03	13·333	13·345	13·356	13·368	13·379	13·391	13·402	13·413	13·425	13·436
·33	5·578	5·615	5·652	5·689	5·726	5·743	5·780	5·817	5·863	5·909	·02	13·448	13·459	13·470	13·482	13·493	13·505	13·516	13·527	13·539	13·550
·34	5·955	6·001	6·047	6·093	6·139	6·190	6·241	6·292	6·343	6·394	·01	13·561	13·573	13·585	13·596	13·607	13·618	13·630	13·642	13·653	13·665
·35	6·490	6·631	6·772	6·913	7·074	7·242	...	...	...	...	·00	13·675	13·687	13·698	13·709	13·720	13·731	13·742	13·753	13·765	13·777

9—EYE-TABLE FOR YOGAS—*continued.*

Moon's anomaly and equation of the centre expressed in days and fractions of a day.

(BRAHMA SIDDHĀNTA AND SIDDHĀNTA ŚIROMAṆI.)

Eqn. +	0	1	2	3	4	5	6	7	8	9	Eqn. +	9	8	7	6	5	4	3	2	1	0
	Moon's anomaly in days.											Moon's anomaly in days.									
·00	13·777	13·789	13·801	13·812	13·823	13·834	13·845	13·856	13·867	13·879	·35	...	...	...	...	20·312	20·480	20·641	20·782	20·923	21·064
·01	13·889	13·901	13·912	13·924	13·936	13·947	13·958	13·969	13·981	13·993	·34	21·160	21·211	21·262	21·313	21·364	21·415	21·461	21·507	21·553	21·599
·02	14·004	14·015	14·027	14·038	14·049	14·061	14·072	14·084	14·095	14·106	·33	21·645	21·691	21·737	21·774	21·791	21·828	21·865	21·902	21·939	21·976
·03	14·118	14·129	14·141	14·152	14·163	14·175	14·186	14·198	14·209	14·221	·32	22·013	22·050	22·087	22·124	22·159	22·190	22·221	22·252	22·283	22·314
·04	14·232	14·242	14·254	14·266	14·277	14·289	14·299	14·311	14·323	14·335	·31	22·345	22·371	22·397	22·423	22·449	22·475	22·501	22·527	22·553	22·579
·05	14·346	14·357	14·368	14·380	14·391	14·402	14·414	14·425	14·437	14·448	·30	22·605	22·631	22·656	22·681	22·706	22·731	22·756	22·781	22·806	22·831
·06	14·459	14·471	14·482	14·494	14·505	14·516	14·528	14·539	14·551	14·562	·29	22·855	22·879	22·902	22·926	22·949	22·972	22·995	23·018	23·042	23·066
·07	14·575	14·587	14·598	14·610	14·622	14·634	14·646	14·657	14·669	14·681	·28	23·089	23·112	23·135	23·158	23·180	23·202	23·224	23·246	23·269	23·290
·08	14·692	14·704	14·716	14·728	14·740	14·751	14·763	14·775	14·787	14·799	·27	23·311	23·332	23·353	23·374	23·395	23·416	23·437	23·458	23·479	23·499
·09	14·810	14·822	14·834	14·845	14·857	14·869	14·880	14·892	14·904	14·916	·26	23·519	23·539	23·559	23·579	23·599	23·617	23·636	23·656	23·676	23·696
·10	14·928	14·939	14·951	14·962	14·974	14·986	14·998	15·010	15·022	15·033	·25	23·716	23·734	23·753	23·771	23·791	23·810	23·829	23·847	23·865	23·884
·11	15·045	15·057	15·069	15·081	15·093	15·105	15·117	15·130	15·143	15·156	·24	23·903	23·922	23·940	23·957	23·975	23·993	24·010	24·028	24·046	24·064
·12	15·169	15·182	15·194	15·206	15·219	15·232	15·244	15·256	15·268	15·280	·23	24·081	24·098	24·116	24·136	24·154	24·172	24·190	24·208	24·226	24·243
·13	15·293	15·306	15·318	15·330	15·342	15·354	15·367	15·379	15·392	15·404	·22	24·261	24·278	24·295	24·312	24·329	24·346	24·363	24·380	24·396	24·412
·14	15·416	15·428	15·441	15·454	15·467	15·479	15·491	15·503	15·515	15·528	·21	24·428	24·444	24·460	24·476	24·492	24·508	24·524	24·540	24·557	24·574
·15	15·540	15·552	15·565	15·577	15·589	15·602	15·614	15·627	15·639	15·651	·20	24·590	24·606	24·622	24·638	24·654	24·670	24·687	24·703	24·720	24·737
·16	15·664	15·677	15·690	15·703	15·716	15·729	15·742	15·755	15·768	15·781	·19	24·754	24·770	24·786	24·802	24·818	24·834	24·850	24·866	24·882	24·898
·17	15·794	15·806	15·819	15·832	15·845	15·858	15·871	15·884	15·897	15·909	·18	24·914	24·930	24·946	24·961	24·976	24·991	25·006	25·021	25·036	25·051
·18	15·922	15·935	15·948	15·961	15·974	15·987	16·000	16·013	16·027	16·041	·17	25·066	25·080	25·095	25·110	25·125	25·140	25·155	25·170	25·185	25·199
·19	16·055	16·069	16·083	16·097	16·111	16·125	16·139	16·153	16·167	16·181	·16	25·214	25·229	25·244	25·259	25·274	25·289	25·304	25·319	25·334	25·349
·20	16·196	16·211	16·226	16·240	16·255	16·269	16·283	16·297	16·311	16·325	·15	25·364	25·378	25·392	25·407	25·421	25·436	25·450	25·464	25·479	25·493
·21	16·339	16·354	16·369	16·383	16·397	16·411	16·425	16·439	16·453	16·467	·14	25·507	25·522	25·536	25·550	25·564	25·578	25·593	25·608	25·623	25·637
·22	16·481	16·495	16·509	16·524	16·539	16·554	16·569	16·584	16·599	16·614	·13	25·651	25·665	25·680	25·694	25·709	25·723	25·737	25·751	25·765	25·780
·23	16·630	16·645	16·661	16·677	16·693	16·709	16·725	16·741	16·757	16·772	·12	25·795	25·809	25·823	25·837	25·851	25·866	25·881	25·895	25·909	25·924
·24	16·787	16·803	16·819	16·835	16·850	16·866	16·882	16·897	16·913	16·930	·11	25·939	25·954	25·969	25·984	25·998	26·012	26·026	26·040	26·054	26·068
·25	16·947	16·964	16·980	16·996	17·013	17·030	17·048	17·064	17·081	17·097	·10	26·082	26·095	26·109	26·123	26·137	26·151	26·165	26·178	26·192	26·205
·26	17·115	17·133	17·151	17·169	17·186	17·202	17·220	17·238	17·256	17·274	·09	26·219	26·233	26·247	26·261	26·274	26·288	26·302	26·315	26·329	26·343
·27	17·292	17·310	17·329	17·348	17·367	17·386	17·405	17·424	17·443	17·462	·08	26·356	26·370	26·384	26·398	26·412	26·425	26·439	26·453	26·467	26·481
·28	17·481	17·500	17·521	17·541	17·561	17·581	17·601	17·622	17·643	17·664	·07	26·494	26·508	26·522	26·535	26·549	26·563	26·577	26·591	26·604	26·618
·29	17·685	17·707	17·729	17·750	17·771	17·792	17·813	17·835	17·856	17·878	·06	26·632	26·646	26·660	26·673	26·687	26·700	26·713	26·727	26·740	26·754
·30	17·900	17·923	17·946	17·969	17·992	18·015	18·036	18·061	18·084	18·108	·05	26·767	26·780	26·794	26·807	26·821	26·834	26·847	26·861	26·874	26·887
·31	18·132	18·156	18·180	18·204	18·228	18·252	18·276	18·300	18·324	18·348	·04	26·900	26·914	26·928	26·942	26·954	26·968	26·981	26·995	27·009	27·021
·32	18·377	18·406	18·435	18·464	18·493	18·522	18·555	18·590	18·625	18·660	·03	27·034	27·048	27·061	27·074	27·087	27·101	27·114	27·127	27·141	27·154
·33	18·695	18·730	18·765	18·800	18·835	18·850	18·885	18·920	18·964	19·008	·02	27·168	27·181	27·194	27·208	27·221	27·235	27·248	27·261	27·275	27·288
·34	19·052	19·096	19·140	19·184	19·228	19·277	19·326	19·375	19·424	19·473	·01	27·301	27·315	27·329	27·342	27·355	27·368	27·382	27·396	27·409	27·423
·35	19·567	19·706	19·845	19·984	20·123	20·312	...	...	...	...	·00	27·435	27·449	27·462	27·475	27·488	27·501	27·514	27·527	27·541	27·555

h—EYE-TABLE FOR TITHIS.

Sun's anomaly expressed as days of the solar year and sun's equation of the centre in fractions of a day.

(BRAHMA SIDDHĀNTA AND SIDDHĀNTA ŚIROMAṆI.)

Eqn. +	9	8	7	6	5	4	3	2	1	0
	Sun's anomaly in days of the solar year.									
·175	...	...	...	...	0·16	0·36	0·56	0·76	0·96	1·16
·174	1·30	1·45	1·59	1·73	1·87	2·02	2·16	2·30	2·44	2·59
·173	2·73	2·87	3·02	3·16	3·30	3·44	3·58	3·73	3·87	4·01
·172	4·16	4·30	4·44	4·58	4·73	4·87	5·01	5·13	5·24	5·35
·171	5·47	5·59	5·70	5·82	5·92	6·04	6·15	6·26	6·37	6·49
·170	6·60	6·72	6·83	6·94	7·04	7·17	7·28	7·40	7·51	7·72
·16	8·76	9·69	10·62	11·55	12·49	13·28	14·27	14·86	15·65	16·44
·15	17·13	17·82	18·51	19·20	19·90	20·54	21·16	21·77	22·39	23·00
·14	23·62	24·20	24·76	25·32	25·89	26·45	27·01	27·55	28·08	28·60
·13	29·12	29·64	30·16	30·68	31·21	31·71	32·20	32·67	33·15	33·62
·12	34·10	34·58	35·05	35·51	35·97	36·42	36·87	37·32	37·77	38·22
·11	38·66	39·10	39·52	39·95	40·39	40·82	41·24	41·66	42·08	42·50
·10	42·92	43·13	43·74	44·15	44·56	44·97	45·37	45·77	46·17	46·56
·09	46·94	47·33	47·71	48·09	48·49	48·87	49·25	49·63	50·02	50·40
·08	50·78	51·15	51·52	51·89	52·27	52·64	53·01	53·38	53·75	54·11
·07	54·47	54·83	55·19	55·55	55·92	56·27	56·63	56·99	57·35	57·70
·06	58·06	58·41	58·76	59·11	59·47	59·82	60·17	60·52	60·88	61·23
·05	61·58	61·93	62·28	62·63	62·99	63·33	63·67	64·01	64·35	64·69
·04	65·03	65·37	65·70	66·02	66·36	66·70	67·03	67·37	67·70	68·04
·03	68·37	68·71	69·05	69·38	69·72	70·05	70·38	70·77	71·04	71·38
·02	71·71	72·04	72·37	72·70	73·04	73·37	73·69	74·02	74·35	74·68
·01	75·00	75·33	75·66	75·99	76·33	76·65	76·98	77·31	77·64	77·96
·00	78·29	78·62	78·94	79·27	79·61	79·94	80·26	80·58	80·91	81·23

Eqn. −	9	8	7	6	5	4	3	2	1	0
	Sun's anomaly in days of the solar year.									
·178	...	...	...	...	...	172·72	173·63	174·57	175·52	176·52
·177	176·89	177·24	177·59	177·94	178·29	178·64	178·99	179·34	179·69	180·06
·176	180·34	180·54	180·74	180·94	181·14	181·34	181·54	181·74	181·94	182·14
·175	182·34	182·54	182·74	182·94	183·13	183·33	183·53	183·73	183·93	184·13
·174	184·27	184·42	184·56	184·70	184·84	184·99	185·13	185·27	185·41	185·56
·173	185·70	185·84	185·99	186·13	186·27	186·41	186·55	186·70	186·84	186·98
·172	187·13	187·27	187·41	187·55	187·70	187·84	187·98	188·10	188·21	188·32
·171	188·44	188·55	188·66	188·78	188·89	189·01	189·12	189·23	189·34	189·46
·170	189·57	189·69	189·80	189·91	190·03	190·14	190·25	190·37	190·48	190·59
·16	191·73	192·66	193·59	194·52	195·44	196.23	197·02	197·81	198·60	199·39
·15	200·18	200·77	201·46	202·15	202·83	203·47	204·09	204·70	205·32	205·93
·14	206·55	207·13	207·69	208·25	208·80	209·36	209·92	210·46	210·99	211·51
·13	212·03	212·55	213·07	213·59	214·10	214·60	215·09	215·56	216·04	216·51
·12	216·99	217·47	217·94	218·40	218·84	219·29	219·74	220·19	220·64	221·09
·11	221·53	221·97	222·39	222·82	223·24	223·77	224·09	224·51	224·71	225·35
·10	225·77	226·18	226·59	227·00	227·39	227·80	228·20	228·60	229·00	229·39
·09	229·77	230·16	230·54	230·92	231·30	231·68	232·06	232·44	232·83	233·31
·08	233·59	233·96	234·33	234·70	235·06	235·43	235·80	236·17	236·54	236·90
·07	236·26	237·62	237·98	238·34	238·69	239·04	239·40	239·76	240·12	240·47
·06	240·83	241·18	241·53	241·88	242·22	242·57	242·92	243·27	243·63	243·98
·05	244·33	244·68	245·03	245·38	245·72	246·06	246·40	246·74	247·08	247·42
·04	247·76	248·10	248·43	248·75	249·07	249·41	249·74	250·08	250·41	250·75
·03	251·08	251·42	251·75	252·09	252·41	252·74	253·07	253·40	253·73	254·07
·02	254·40	254·73	255·06	255·39	255·71	256·04	256·36	256·69	257·02	257·35
·01	257·67	258·00	258·33	258·66	258·96	259·30	259·63	259·96	260·29	260·61
·00	260·94	261·27	261·59	261·92	262·24	262·57	262·89	263·21	263·54	263·86

Eqn. −	0	1	2	3	4	5	6	7	8	9
	Sun's anomaly in days of the solar year.									
·00	81·23	81·55	81·88	82·20	82·52	82·85	83·19	83·52	83·84	84·17
·01	84·50	84·82	85·15	85·48	85·81	86·13	86·47	86·80	87·13	87·46
·02	87·78	88·11	88·44	88·77	89·09	89·42	89·76	90·09	90·42	90·75
·03	91·08	91·42	91·75	92·08	92·41	92·74	93·08	93·42	93·75	94·09
·04	94·42	94·76	95·09	95·43	95·76	96·10	96·44	96·76	97·09	97·43
·05	97·77	98·11	98·45	98·79	99·13	99·47	99·83	100·18	100·53	100·88
·06	101·23	101·58	101·94	102·29	102·64	102·99	103·35	103·70	104·05	104·40
·07	104·76	105·11	105·47	105·83	106·19	106·54	106·91	107·27	107·63	107·99
·08	108·35	108·71	109·08	109·45	109·82	110·19	110·57	110·94	111·31	111·68
·09	112·06	112·44	112·83	113·21	113·59	113·97	114·37	114·75	115·13	115·52
·10	115·90	116·29	116·69	117·09	117·49	117·90	118·31	118·72	119·13	119·54
·11	119·93	120·16	120·80	121·22	121·64	122·06	122·50	122·93	123·35	123·79
·12	124·23	124·68	125·13	125·58	126·03	126·48	126·94	127·40	127·87	128·35
·13	128·83	129·30	129·78	130·25	130·74	131·24	131·77	132·29	132·81	133·33
·14	133·85	134·37	134·90	135·44	136·00	136·56	137·13	137·69	138·25	138·83
·15	139·45	140·06	140·68	141·29	141·91	142·55	143·25	143·94	144·63	145·32
·16	146·01	146·80	147·59	148·38	149·17	149·96	150·90	151·83	152·76	153·69
·170	154·83	154·94	155·05	155·17	155·28	155·39	155·51	155·62	155·73	155·85
·171	155·96	156·08	156·19	156·30	156·41	156·53	156·64	156·76	156·87	156·98
·172	157·10	157·21	157·32	157·44	157·58	157·72	157·87	158·01	158·15	158·29
·173	158·44	158·58	158·72	158·87	159·01	159·15	159·29	159·43	159·58	159·72
·174	159·86	160·01	160·15	160·29	160·43	160·58	160·72	160·86	161·00	161·15
·175	161·29	161·49	161·69	161·89	162·09	162·29	162·50	162·70	162·90	163·10
·176	163·30	163·50	163·70	163·90	164·10	164·30	164·50	164·70	164·90	165·10
·177	165·41	165·76	166·11	166·47	166·81	167·16	167·51	167·86	168·21	168·56
·178	168·93	169·87	170·82	171·77	172·72	...	...	...	...	...

Eqn. +	0	1	2	3	4	5	6	7	8	9
	Sun's anomaly in days of the solar year.									
·00	263·86	264·18	264·51	264·83	265·15	265·48	265·80	266·13	266·45	266·78
·01	267·11	267·43	267·76	268·09	268·42	268·74	269·06	269·39	269·72	270·05
·02	270·37	270·70	271·03	271·36	271·68	272·01	272·33	272·66	272·99	273·32
·03	273·65	273·99	274·32	274·65	274·98	275·31	275·63	275·97	276·30	276·64
·04	276·97	277·31	277·64	277·98	278·31	278·65	278·97	279·29	279·62	279·96
·05	280·30	280·64	280·98	281·32	281·66	282·00	282·34	282·69	283·04	283·39
·06	283·74	284·09	284·45	284·80	285·15	285·50	285·84	286·19	286·54	286·89
·07	287·25	287·60	287·96	288·32	288·68	289·03	289·38	289·74	290·10	290·46
·08	290·82	291·18	291·55	291·92	292·29	292·66	293·02	293·39	293·76	294·13
·09	294·51	294·89	295·28	295·66	296·04	296·42	296·80	297·18	297·56	297·95
·10	298·33	298·72	299·12	299·52	299·92	300·33	300·72	301·13	301·54	301·95
·11	302·37	302·79	303·21	303·63	304·05	304·47	304·89	305·32	305·74	306·18
·12	306·62	307·07	307·52	307·97	308·42	308·87	309·31	309·77	310·24	310·72
·13	311·20	311·67	312·15	312·62	313·11	313·61	314·12	314·64	315·16	315·68
·14	316·20	316·72	317·25	317·79	318·35	318·91	319·46	320·02	320·58	321·16
·15	321·78	322·39	323·01	323·62	324·24	324·88	325·56	326·25	326·94	327·63
·16	328·32	329·11	329·90	330·69	331·48	332·27	333·19	334·12	335·05	335·98
·170	337·12	337·23	337·34	337·46	337·57	337·68	337·80	337·91	338·02	338·14
·171	338·25	338·37	338·48	338·59	338·70	338·82	338·93	339·05	339·16	339·27
·172	339·39	339·50	339·61	339·73	339·87	340·01	340·16	340·30	340·44	340·58
·173	340·73	340·87	341·01	341·16	341·30	341·44	341·58	341·72	341·87	342·01
·174	342·15	342·30	342·44	342·58	342·72	342·87	343·01	343·15	343·29	343·44
·175	343·58	343·78	343·98	344·18	344·38	344·58	344·77	344·97	345·18	345·37
·176	345·57	345·77	345·97	346·17	346·37	346·57	346·77	346·97	347·17	347·37
·177	347·58	347·93	348·28	348·63	348·98	349·33	349·68	350·03	350·38	350·78
178	351·20	352·14	353·09	354·04	354·99	...	...	...	...	...

Eqn. +	9	8	7	6	5	4	3	2	1	0
	Sun's anomaly in days of the solar year.									
·178	...	...	...	...	...	354·99	355·90	356·84	357·79	358·79
·177	359·16	359·51	359·86	360·21	360·56	360·91	361·26	361·61	361·96	362·33
·176	362·61	362·81	363·01	363·21	363·41	363·61	363·81	364·01	364·21	364·41
·175	364·61	364·81	365·01	365·21	...	...	...	...	...	...

i—EYE-TABLE FOR YOGAS.

Sun's anomaly expressed as days of the solar year and sun's equation of the centre in fractions of a day.

(BRAHMA SIDDHĀNTA AND SIDDHĀNTA ŚIROMAṆI.)

Eqn. —	9	8	7	6	5	4	3	2	1	0
			Sun's anomaly in days of the solar year.							
·151	...	...	...	...	...	...	0·16	0·40	0·64	0·88
·150	1·05	1·22	1·40	1·57	1·75	1·93	2·10	2·28	2·45	2·62
·14	4·33	5·90	7·80	8·51	9·61	10·71	11·81	12·81	13·62	14·63
·13	15·54	16·45	17·36	18·12	18·87	19·63	20·39	21·15	21·91	22·67
·12	23·34	24·02	24·69	25·36	26·02	26·69	27·32	27·95	28·57	29·19
·11	29·81	30·43	30·99	31·55	32·10	32·66	33·22	33·78	34·34	34·90
·10	35·45	35·98	36·55	37·10	37·59	38·09	38·59	39·09	39·59	40·09
·09	40·59	41·07	41·56	42·05	42·53	43·02	43·51	43·97	44·43	44·90
·08	45·37	45·84	46·31	46·78	47·24	47·67	48·11	48·55	48·99	49·42
·07	49·86	50·30	50·74	51·18	51·61	52·05	52·48	52·89	53·32	53·74
·06	54·17	54·59	55·01	55·43	55·84	56·26	56·68	57·10	57·51	57·92
·05	58·33	58·74	59·15	59·56	59·96	60·37	60·78	61·19	61·59	61·99
·04	62·40	62·80	63·20	63·60	64·00	64·39	64·77	65·16	65·56	65·95
·03	66·34	66·73	67·10	67·48	67·86	68·26	68·66	69·05	69·43	69·81
·02	70·20	70·59	70·98	71·36	71·73	72·12	72·49	72·87	73·25	73·63
·01	74·41	74·39	74·77	75·15	75·52	75·90	76·28	76·66	77·04	77·42
·00	77·80	78·18	78·56	78·94	79·31	79·69	80·07	80·45	80·83	81·22

Eqn. +	9	8	7	6	5	4	3	2	1	0
			Sun's anomaly in days of the solar year.							
·153	...	...	...	172·39	173·27	174·15	175·02	175·89	176·76	177·63
·152	177·95	178·27	178·59	178·91	179·23	179·55	179·87	180·19	180·50	180·81
·151	181·05	181·29	181·53	181·77	182·01	182·25	182·49	182·73	182·97	183·21
·150	183·38	183·55	183·73	183·90	184·08	184·26	184·43	184·61	184·78	184·95
·14	186·66	188·23	189·63	190·84	191·96	193·06	194·16	195·16	196·07	196·98
·13	197·89	198·80	199·71	200·47	201·24	202·00	202·76	203·52	204·28	205·04
·12	205·71	206·39	207·06	207·73	208·41	209·08	209·71	210·34	210·96	211·58
·11	212·20	212·82	213·38	213·94	214·51	215·07	215·63	216·19	216·75	217·31
·10	217·86	218·39	218·96	219·51	220·02	220·52	221·02	221·40	222·02	222·52
·09	223·02	223·50	223·99	224·48	224·98	225·47	225·96	226·42	226·88	227·35
·08	227·82	228·29	228·76	229·23	229·71	230·14	230·58	231·02	231·46	231·89
·07	232·33	232·77	233·21	233·65	234·10	234·54	234·97	235·38	235·81	236·23
·06	236·66	237·08	237·50	237·92	238·35	238·77	239·19	239·61	240·02	240·43
·05	240·84	241·25	241·66	242·07	242·49	242·90	243·31	243·72	244·12	244·52
·04	244·93	245·33	245·73	246·13	246·54	246·94	247·32	247·71	248·11	248·50
·03	248·89	249·28	249·65	250·03	250·43	250·83	251·23	251·62	252·00	252·38
·02	252·77	253·16	253·55	253·93	254·32	254·70	255·08	255·45	255·84	256·22
·01	256·61	256·99	257·37	257·75	258·14	258·52	258·90	259·28	259·66	260·04
·00	260·42	260·80	261·18	261·56	261·95	262·33	262·71	263·09	263·47	263·86

Eqn. +	0	1	2	3	4	5	6	7	8	9
				Sun's anomaly in days of the solar year.						
·00	81·23	81·62	82·00	82·38	82·76	83·14	83·51	83·89	84·27	84·65
·01	85·03	85·41	85·79	86·17	86·55	86·93	87·30	87·68	88·06	88·44
·02	88·82	89·20	89·58	89·96	90·34	90·72	91·09	91·47	91·86	92·25
·03	92·64	93·02	93·40	93·79	94·19	94·59	94·97	95·35	95·71	96·11
·04	96·50	96·89	97·29	97·68	98·06	98·46	98·85	99·25	99·65	100·05
·05	100·46	100·86	101·26	101·67	102·08	102·49	102·89	103·30	103·71	104·12
·06	104·53	104·94	105·35	105·77	106·19	106·61	107·02	107·44	107·86	108·28
·07	108·71	109·13	109·56	109·97	110·40	110·84	111·27	111·71	112·15	112·59
·08	113·03	113·46	113·90	114·34	114·78	115·21	115·67	116·14	116·61	117·08
·09	117·55	118·02	118·48	118·94	119·43	119·92	120·40	120·89	121·38	121·86
·10	122·36	122·86	123·36	123·86	124·36	124·86	125·35	125·91	126·47	127·00
·11	127·55	128·11	128·67	129·23	129·79	130·35	130·90	131·46	132·02	132·64
·12	133·26	133·88	134·50	135·13	135·76	136·43	137·09	137·76	138·43	139·11
·13	139·78	140·54	141·30	142·06	142·82	143·58	144·33	145·09	145·00	146·91
·14	147·82	148·73	149·64	150·61	151·74	152·84	153·94	155·15	156·55	158·12
·150	159·83	160·00	160·17	160·35	160·52	160·70	160·88	161·05	161·23	161·40
·151	161·57	161·81	162·05	162·29	162·53	162·77	163·01	163·25	163·49	163·73
·152	163·97	164·28	164·59	164·91	165·23	165·55	165·87	166·19	166·51	166·83
·153	167·15	168·02	168·89	169·76	170·63	171·51	172·39	...	...	...

Eqn. —	0	1	2	3	4	5	6	7	8	9
				Sun's anomaly in days of the solar year.						
·00	263·86	264·25	264·63	265·01	265·39	265·77	266·16	266·54	266·94	267·30
·01	267·68	268·06	268·44	268·82	269·20	269·58	269·97	270·35	270·73	271·11
·02	271·49	271·87	272·25	272·63	273·00	273·39	273·78	274·16	274·55	274·94
·03	275·33	275·71	276·09	276·48	276·88	277·28	277·68	278·06	278·43	278·82
·04	279·21	279·60	280·00	280·39	280·77	281·17	281·58	281·98	282·38	282·78
·05	283·19	283·59	283·99	284·40	284·71	285·22	285·64	286·05	286·46	286·87
·06	287·28	287·69	288·10	288·52	288·94	289·36	289·79	290·21	290·63	291·05
·07	291·48	291·99	292·33	292·74	293·17	293·61	294·06	294·50	294·94	295·38
·08	295·82	296·25	296·69	297·13	297·57	298·00	298·48	298·95	299·42	299·89
·09	300·36	300·83	301·29	301·75	302·24	302·73	303·23	303·72	304·21	304·69
·10	305·19	305·69	306·19	306·69	307·19	307·69	308·20	308·75	309·32	309·85
·11	310·40	310·96	311·52	312·08	312·64	313·20	313·77	314·33	314·89	315·51
·12	316·13	316·75	317·37	318·00	318·63	319·30	319·98	320·65	321·32	322·00
·13	322·67	323·43	324·19	324·95	325·71	326·47	327·24	328·00	328·91	329·82
·14	330·73	331·74	332·55	333·55	334·65	335·75	336·87	338·08	339·48	341·05
·150	342·76	342·93	343·10	343·28	343·45	343·63	343·81	343·98	344·16	344·33
·151	344·50	344·74	344·98	345·22	345·46	345·70	345·94	346·18	346·42	346·66
·152	346·90	347·21	347·52	347·84	348·16	348·48	348·80	349·12	349·44	349·76
·153	350·08	350·95	351·82	352·69	353·56	354·44	355·32	...	...	...

Eqn. +	9	8	7	6	5	4	3	2	1	0
.153	...	...	...	355·32	356·20	357·08	357·95	358·82	359·69	360·56
·152	360·88	361·20	361·52	361·84	362·16	362·48	362·80	363·12	363·43	363·74
·151	363·98	364·22	364·46	364·70	364·94	365·18	...	...	...	...

TABLE I (i).

Jupiter's Cycle of 60 years—Southern Cycle. A.D. 967 to 1926 with corresponding A.D. years—(Centuries A.D. in heavy type).

(*N.B.*—The Indian year begins in March or April of the A.D. year.)

1	Prabhava	...	**9** 67	**10** 27	**10** 87	**11** 47	**12** 07	**12** 67	**13** 27	**13** 87	**14** 47	**15** 07	**15** 67	**16** 27	**16** 87	**17** 47	**18** 07	**18** 67
2	Vibhava	...	68	28	88	48	08	68	28	88	48	08	68	28	88	48	08	68
3	Śukla ...	...	69	29	89	49	09	69	29	89	49	09	69	29	89	49	09	69
4	Pramodhūta	...	70	30	90	50	10	70	30	90	50	10	70	30	90	50	10	70
5	Prajāpati	...	71	31	91	51	11	71	31	91	51	11	71	31	91	51	11	71
6	Aṅgirasa	...	72	32	92	52	12	72	32	92	52	12	72	32	92	52	12	72
7	Śrīmukha	...	73	33	93	53	13	73	33	93	53	13	73	33	93	53	13	73
8	Bhāva	...	74	34	94	54	14	74	34	94	54	14	74	34	94	54	14	74
9	Yuva ...	...	75	35	95	55	15	75	35	95	55	15	75	35	95	55	15	75
10	Dhātri	...	76	36	96	56	16	76	36	96	56	16	76	36	96	56	16	76
11	Īśvara	...	77	37	97	57	17	77	37	97	57	17	77	37	97	57	17	77
12	Bahudhānya	...	78	38	98	58	18	78	38	98	58	18	78	38	98	58	18	78
13	Pramāthi	...	79	39	99	59	19	79	39	99	59	19	79	39	99	59	19	79
14	Vikrama	...	80	40	**11** 00	60	20	80	40	**14** 00	60	20	80	40	**17** 00	60	20	80
15	Vṛisha	...	81	41	01	61	21	81	41	01	61	21	81	41	01	61	21	81
16	Chitrabhānu	...	82	42	02	62	22	82	42	02	62	22	82	42	02	62	22	82
17	Subhānu	...	83	43	03	63	23	83	43	03	63	23	83	43	03	63	23	83
18	Tāraṇa	...	84	44	04	64	24	84	44	04	64	24	84	44	04	64	24	84
19	Pārthiva	...	85	45	05	65	25	85	45	05	65	25	85	45	05	65	25	85
20	Vyaya	...	86	46	06	66	26	86	46	06	66	26	86	46	06	66	26	86
21	Sarvajit	...	87	47	07	67	27	87	47	07	67	27	87	47	07	67	27	87
22	Sarvadhāri	...	88	48	08	68	28	88	48	08	68	28	88	48	08	68	28	88
23	Virodhi	...	89	49	09	69	29	89	49	09	69	29	89	49	09	69	29	89
24	Vikṛita	...	90	50	10	70	30	90	50	10	70	30	90	50	10	70	30	90
25	Khara ...	...	91	51	11	71	31	91	51	11	71	31	91	51	11	71	31	91
26	Nandana	...	92	52	12	72	32	92	52	12	72	32	92	52	12	72	32	92
27	Vijaya	...	93	53	13	73	33	93	53	13	73	33	93	53	13	73	33	93
28	Jaya ...	...	94	54	14	74	34	94	54	14	74	34	94	54	14	74	34	94
29	Manmatha	...	95	55	15	75	35	95	55	15	75	35	95	55	15	75	35	95
30	Durmukha	...	96	56	16	76	36	96	56	16	76	36	96	56	16	76	36	96
31	Hemalamba	...	97	57	17	77	37	97	57	17	77	37	97	57	17	77	37	97
32	Vilamba	...	98	58	18	78	38	98	58	18	78	38	98	58	18	78	38	98
33	Vikāri ...	...	99	59	19	79	39	99	59	19	79	39	99	59	19	79	39	99
34	Śārvari	...	**10** 00	60	20	80	40	**13** 00	60	20	80	40	**16** 00	60	20	80	40	**19** 00
35	Plava ...	...	01	61	21	81	41	01	61	21	81	41	01	61	21	81	41	01
36	Śubhakṛit	...	02	62	22	82	42	02	62	22	82	42	02	62	22	82	42	02
37	Sobhana (Sobhakrit).		03	63	23	83	43	03	63	23	83	43	03	63	23	83	43	03
38	Krodhi	...	04	64	24	84	44	04	64	24	84	44	04	64	24	84	44	04
39	Viśvāvasu	...	05	65	25	85	45	05	65	25	85	45	05	65	25	85	45	05
40	Parābhava	...	06	66	26	86	46	06	66	26	86	46	06	66	26	86	46	06
41	Plavaṅga	...	07	67	27	87	47	07	67	27	87	47	07	67	27	87	47	07
42	Kīlaka	...	08	68	28	88	48	08	68	28	88	48	08	68	28	88	48	08
43	Saumya	...	09	69	29	89	49	09	69	29	89	49	09	69	29	89	49	09
44	Sādharaṇa	...	10	70	30	90	50	10	70	30	90	50	10	70	30	90	50	10
45	Virodhakṛit	...	11	71	31	91	51	11	71	31	91	51	11	71	31	91	51	11
46	Paridhāvi	...	12	72	32	92	52	12	72	32	92	52	12	72	32	92	52	12
47	Pramādīcha	...	13	73	33	93	53	13	73	33	93	53	13	73	33	93	53	13
48	Ānanda	...	14	74	34	94	54	14	74	34	94	54	14	74	34	94	54	14
49	Rākshasa	...	15	75	35	95	55	15	75	35	95	55	15	75	35	95	55	15
50	Anala (Nala).		16	76	36	96	56	16	76	36	96	56	16	76	36	96	56	16
51	Piṅgala	...	17	77	37	97	57	17	77	37	97	57	17	77	37	97	57	17
52	Kālayukta	...	18	78	38	98	58	18	78	38	98	58	18	78	38	98	58	18
53	Siddhārthi	...	19	79	39	99	59	19	79	39	99	59	19	79	39	99	59	19
54	Raudra	...	20	80	40	**12** 00	60	20	80	40	**15** 00	60	20	80	40	**18** 00	60	20
55	Durmati	...	21	81	41	01	61	21	81	41	01	61	21	81	41	01	61	21
56	Dundubhi	...	22	82	42	02	62	22	82	42	02	62	22	82	42	02	62	22
57	Rudhirodgāri.		23	83	43	03	63	23	83	43	03	63	23	83	43	03	63	23
58	Raktākṣha	...	24	84	44	04	64	24	84	44	04	64	24	84	44	04	64	24
59	Krodhana	...	25	85	45	05	65	25	85	45	05	65	25	85	45	05	65	25
60	Kshaya (Akshaya)		26	86	46	06	66	26	86	46	06	66	26	86	46	06	66	26

TABLE I (ii).

Jupiter's Cycle of 60 years—Northern System, showing suppressed years. A.D. 280 to A.D. 2000.

0	Vijaya	**2** 80	**3** 39	**3** 98	**4** 58	5 17	**5** 76	6 36	**0**	6 95	**7** 54	8 14	8 73	**9** 32	9 92	**10** 51	**11** 10
1	Jaya	81	40	39	59	18	77	37	**1**	96	55	15	74	33	93	52	11
2	Manmatha ...	82	41	**4** 00	60	19	78	38	**2**	97	56	16	75	34	94	53	12
3	Durmukha ...	83	42	01	61	20	79	39	**3**	98	57	17	76	35	...	54	13
4	Hemalamba ...	84	43	02	62	21	80	40	**4**	99	58	18	77	36	95	55	14
5	Vilamba ...	85	44	03	63	22	81	41	**5**	**7** 00	59	19	78	37	96	56	15
6	Vikārin	86	45	04	64	23	82	42	**6**	01	60	20	79	38	97	57	16
7	Śārvari	87	46	05	65	24	83	43	**7**	02	61	21	80	39	98	58	17
8	Plava	88	47	06	66	25	84	44	**8**	03	62	22	81	40	99	59	18
9	Śubhakṛit	89	48	07	67	26	85	45	**9**	04	63	23	82	41	**10** 00	60	19
10	Sobhana	90	49	08	68	27	86	46	**10**	05	64	...	83	42	01	61	20
11	Krodhin	91	50	09	69	28	87	47	**11**	06	65	24	84	43	02	62	21
12	Viśvāvasu	92	51	10	70	29	88	48	**12**	07	66	25	85	44	03	63	22
13	Parābhava ...	93	52	11	71	30	89	49	**13**	08	67	26	86	45	04	64	23
14	Plavanga	94	53	12	72	31	90	50	**14**	09	68	27	87	46	05	65	24
15	Kīlaka	95	54	13	73	32	91	51	**15**	10	69	28	88	47	06	66	25
16	Saumya	96	55	14	74	33	92	52	**16**	11	70	29	89	48	07	67	26
17	Sādhāraṇa ...	97	56	15	75	34	93	53	**17**	12	71	30	90	49	08	68	27
18	Virodhakṛit ...	98	57	16	76	35	94	...	**18**	13	72	31	91	50	09	69	28
19	Paridhāvin ...	99	58	17	77	36	95	54	**19**	14	73	32	92	51	10	70	29
20	Pramādin	**3** 00	59	18	78	37	96	55	**20**	15	74	33	93	52	11	71	30
21	Ānanda	01	60	19	79	38	97	56	**21**	16	75	34	94	53	12	72	31
22	Rākshasa	02	61	20	80	39	98	57	**22**	17	76	35	95	54	13	73	32
23	Ānala	03	62	21	81	40	99	58	**23**	18	77	36	96	55	14	74	33
24	Piṅgala	04	63	22	82	41	**6** 00	59	**24**	19	78	37	97	56	15	75	34
25	Kālayukta... ...	05	64	23	...	42	01	60	**25**	20	79	38	98	57	16	76	35
26	Siddhārtin ...	06	65	24	83	43	02	61	**26**	21	80	39	99	58	17	77	36
27	Raudra	07	66	25	84	44	03	62	**27**	22	81	40	**9** 00	59	18	78	37
28	Durmati	08	67	26	85	45	04	63	**28**	23	82	41	01	60	19	79	38
29	Dundubhi	09	68	27	86	46	05	64	**29**	24	83	42	02	61	20	...	39
30	Rudhirodgārin ...	10	69	28	87	47	06	65	**30**	25	84	43	03	62	21	80	40
31	Raktākṣha ...	11	70	29	88	48	07	66	**31**	26	85	44	04	63	22	81	41
32	Krodhana	...	71	30	89	49	08	67	**32**	27	86	45	05	64	23	82	42
33	Kshaya	12	72	31	90	50	09	68	**33**	28	87	46	06	65	24	83	43
34	Prabhava	13	73	32	91	51	10	69	**34**	29	88	47	07	66	25	84	44
35	Vibhava	14	74	33	92	52	11	70	**35**	30	89	48	08	67	26	85	45
36	Śukla	15	75	34	93	53	12	71	**36**	31	90	49	...	68	27	86	46
37	Pramoda	16	76	35	94	54	13	72	**37**	32	91	50	09	69	28	87	47
38	Prajāpati	17	77	36	95	55	14	73	**38**	33	92	51	10	70	29	88	48
39	Aṅgiras	18	78	37	96	56	15	74	**39**	34	93	52	11	71	30	89	49
40	Śrīmukha	19	79	38	97	57	16	75	**40**	35	94	53	12	72	31	90	50
41	Bhāva	20	80	39	98	58	17	76	**41**	36	95	54	13	73	32	91	51
42	Yuva	21	81	40	99	59	18	77	**42**	37	96	55	14	74	33	92	52
43	Dhātri	22	82	41	**5** 00	60	19	78	**43**	38	97	56	15	75	34	93	53
44	Īśvara	23	83	42	01	61	20	79	**44**	...	98	57	16	76	35	94	54
45	Bahudhānya ...	24	84	43	02	62	21	80	**45**	39	99	58	17	77	36	95	55
46	Pramāthin ...	25	85	44	03	63	22	81	**46**	40	**8** 00	59	18	78	37	96	56
47	Vikrama	26	86	45	04	64	23	82	**47**	41	01	60	19	79	38	97	57
48	Vṛisha	27	87	46	05	65	24	83	**48**	42	02	61	20	80	39	98	58
49	Chitrabhānu ...	28	88	47	06	66	25	84	**49**	43	03	62	21	81	40	99	59
50	Subhānu	29	89	48	07	67	26	85	**50**	44	04	63	22	82	41	**11** 00	60
51	Tāraṇa	30	90	49	08	...	27	86	**51**	45	05	64	23	83	42	01	61
52	Pārthiva	31	91	50	09	68	28	87	**52**	46	06	65	24	84	43	02	62
53	Vyaya	32	92	51	10	69	29	88	**53**	47	07	66	25	85	44	03	63
54	Sarvajit	33	93	52	11	70	30	89	**54**	48	08	67	26	86	45	04	64
55	Sarvadhārin ...	34	94	53	12	71	31	90	**55**	49	09	68	27	87	46	05	...
56	Virodhin	35	95	54	13	72	32	91	**56**	50	10	69	28	88	47	06	65
57	Vikṛita	36	96	55	14	73	33	92	**57**	51	11	70	29	89	48	07	66
58	Khara	37	97	56	15	74	34	93	**58**	52	12	71	30	90	49	08	67
59	Nandana	38	...	57	16	75	35	94	**59**	53	13	72	31	91	50	09	68

TABLE I (ii)—*cont.*

Jupiter's Cycle of 60 years—Northern System, showing suppressed years. A.D. 280 to A.D. 2000—*cont.*

0	Vijaya ...	...	**11** 69	**12** 29	**12** 88	**13** 47	**14** 07	**14** 66	**15** 25
1	Jaya ...	...	70	30	89	48	08	67	26
2	Manmatha	...	71	31	90	49	09	68	27
3	Durmukha	...	72	32	91	50	10	69	28
4	Hemalamba	...	73	33	92	51	11	70	29
5	Vilamba	...	74	34	93	52	12	71	30
6	Vikārin	...	75	35	94	53	13	72	31
7	Śārvari	...	76	36	95	54	14	73	32
8	Plava ...	...	77	37	96	55	15	74	33
9	Śubhakrit	...	78	38	97	56	16	75	34
10	Sobhana	...	79	39	98	57	17	76	35
11	Krodhin	...	80	40	99	58	18	77	36
12	Viśvāvasu	...	81	41	**13** 00	59	19	78	37
13	Parābhava	...	82	42	01	60	20	79	38
14	Plavaṅga	...	83	43	02	61	...	80	39
15	Kīlaka	...	84	44	03	62	21	81	40
16	Saumya		85	45	04	63	22	82	41
17	Sādharaṇa	...	86	46	05	64	23	83	42
18	Virodhakṛit	...	87	47	06	65	24	84	43
19	Paridhāvin	...	88	48	07	66	25	85	44
20	Pramādin	...	89	49	08	67	26	86	45
21	Ānanda	...	90	50	09	68	27	87	46
22	Rākshasa	..	91	...	10	69	28	88	47
23	Anala ...	...	92	51	11	70	29	89	48
24	Piṅgala	...	93	52	12	71	30	90	49
25	Kālayukta	...	94	53	13	72	31	91	50
26	Siddhārtin	...	95	54	14	73	32	92	51
27	Raudra	...	96	55	15	74	33	93	52
28	Durmati	...	97	56	16	75	34	94	53
29	Dundubhi	...	98	57	17	76	35	95	54
30	Rudhirodgārin.		99	58	18	77	36	96	55
31	Raktāksha	...	**12** 00	59	19	78	37	97	56
32	Krodhana	...	01	60	20	79	38	98	57
33	Kshaya	...	02	61	21	80	39	99	58
34	Prabhava	...	03	62	22	81	40	**15** 00	59
35	Vibhava	...	04	63	23	82	41	01	60
36	Śukla ...	...	05	64	24	83	42	02	61
37	Pramoda	...	06	65	25	84	43	03	62
38	Prajāpati	...	07	66	26	85	44	04	63
39	Aṅgiras	...	08	67	27	86	45	05	64
40	Śrīmukha	...	09	68	28	87	46	06	65
41	Bhāva	...	10	69	29	88	47	07	66
42	Yuva	...	11	70	30	89	48	08	67
43	Dhātri	...	12	71	31	90	49	09	68
44	Īśvara	...	13	72	32	91	50	10	69
45	Bahudhānya	..	14	73	33	92	51	11	70
46	Pramāthin	...	15	74	34	93	52	12	71
47	Vikrama	...	16	75	35	94	53	13	72
48	Vṛisha	...	17	76	...	95	54	14	73
49	Chitrabhānu	...	18	77	36	96	55	...	74
50	Subhānu	...	19	78	37	97	56	15	75
51	Tārana	...	20	79	38	98	57	16	76
52	Pārthiva	...	21	80	39	99	58	17	77
53	Vyaya	...	22	81	40	**14** 00	59	18	78
54	Sarvajit	...	23	82	41	01	60	19	79
55	Sarvadhārin	...	24	83	42	02	61	20	80
56	Virodhin	...	25	84	43	03	62	21	81
57	Vikṛita	...	26	85	44	04	63	22	82
58	Khara	...	27	86	45	05	64	23	83
59	Nandana	...	28	87	46	06	65	24	84

0	**15** 85	**16** 44	**17** 03	**17** 63	**18** 22	**18** 81	**19** 41
1	86	45	04	64	23	82	...
2	87	46	05	65	24	83	42
3	88	47	06	66	25	84	43
4	89	48	07	67	26	85	44
5	90	49	08	68	27	86	45
6	91	50	09	69	28	87	46
7	92	51	10	70	29	88	47
8	93	52	11	71	30	89	48
9	94	53	12	...	31	90	49
10	95	54	13	72	32	91	50
11	96	55	14	73	33	92	51
12	97	56	15	74	34	93	52
13	98	57	16	75	35	94	53
14	99	58	17	76	36	95	54
15	**16** 00	59	18	77	37	96	55
16	...	60	19	78	38	97	56
17	01	61	20	79	39	98	57
18	02	62	21	80	40	99	58
19	03	63	22	81	41	**19** 00	59
20	04	64	23	82	42	01	60
21	05	65	24	83	43	02	61
22	06	66	25	84	44	03	62
23	07	67	26	85	45	04	63
24	08	68	27	86	46	05	64
25	09	69	28	87	47	06	65
26	10	70	29	88	48	07	66
27	11	71	30	89	49	08	67
28	12	72	31	90	50	09	68
29	13	73	32	91	51	10	69
30	14	74	33	92	52	11	70
31	15	75	34	93	53	12	71
32	16	76	35	94	54	13	72
33	17	77	36	95	55	14	73
34	18	78	37	96	56	15	74
35	19	79	38	97	...	16	75
36	20	80	39	98	57	17	76
37	21	81	40	99	58	18	77
38	22	82	41	**18** 00	59	19	78
39	23	83	42	01	60	20	79
40	24	84	43	02	61	21	80
41	25	85	44	03	62	22	81
42	26	...	45	04	63	23	82
43	27	86	46	05	64	24	83
44	28	87	47	06	65	25	84
45	29	88	48	07	66	26	85
46	30	89	49	08	67	27	86
47	31	90	50	09	68	28	87
48	32	91	51	10	69	29	88
49	33	92	52	11	70	30	89
50	34	93	53	12	71	31	90
51	35	94	54	13	72	32	91
52	36	95	55	14	73	33	92
53	37	96	56	15	74	34	93
54	38	97	57	16	75	35	94
55	39	98	58	17	76	36	95
56	40	99	59	18	77	37	96
57	41	**17** 00	60	19	78	38	97
58	42	01	61	20	79	39	98
59	43	02	62	21	80	40	99

TABLE I (iii).

Months.

Signs of Zodiac; also names of Malabar months.	Lunar months; also Bengal solar months.	Tamil solar months.	Sūrya siddhānta. Number of days in each solar month.	Sūrya siddhānta. Moment of Sankrānti; or No. of days up to beginning of each solar month.	Sūrya siddhānta. Moment of each new moon; or No. of days up to beginning of each lunar month.	Sūrya siddhānta. Increase of ☾'s anomaly up to beginning of each lunar month.	No. of days in anomalistic months.	Ārya siddhānta. No. of days in each solar month.	Ārya siddhānta. Moment of sankrānti; or No. of days up to beginning of each solar month.	
Mēsha (Mal. Mēḍam).	Vaiśākha ...	Chittirai ...	30·93528	...	...	...	1	27·5546	30·92500000	...
Vṛishabha (Mal. Edavam).	Jyeshṭha ...	Vaigāśi ...	31·42028	30·93528	29·53059	1·976	2	55·1092	31·40111111	30·925000
Mithuna ...	Āshāḍha ...	Āni ...	31·64472	62·35555	59·06117	3·952	3	82·6638	31·60722222	62·3261111
Karkaṭaka ...	Śrāvaṇa ...	Āḍi ...	31·47528	94·00028	88·59176	5·928	4	110·2184	31·46777777	93·9833333
Simha ...	Bhādrapada.	Āvaṇi ...	31·01861	125·47555	118·12235	7·904	5	137·7730	31·03472222	125·4011111
Kanyā ...	Āśvina ...	Puraṭṭāśi ...	30·44138	156·49417	147·65293	9·880	6	165·3276	30·45666666	156·4358333
Tulā ...	Kārttika ...	Aippaśi ...	29·89333	186·93555	177·18353	11·856	7	192·8822	29·90333333	186·8925000
Vṛiśchika ...	Mārgaśirsha.	Kārttigai ...	29·49027	216·82888	206·71411	13·832	8	220·4368	29·50861111	216·7958333
Dhanus ...	Pausha ...	Mārgaḷi ...	29·31777	246·31916	236·24470	15·808	9	247·9914	29·35055555	246·3044444
Makara ...	Māgha ...	Tai ...	29·44805	275·63694	265·77529	17·784	10	275·5460	29·45666666	276·6550000
Kumbha ...	Phālguna ...	Māśi ...	29·82027	305·08499	295·30588	19·760	11	303·1006	29·80833333	305·1116666
Mina ...	Chaitra ...	Paṅguni ...	30·35348	334·90527	324·83647	21·736	12	330·6552	30·33876157	334·9200000
			365·25875	354·36705	23·712		13	358·2098		365·2586805
				383·89764	25·688					

TABLE I (iv). (See p. 30 of Text)

Limits of Adhika months.

	Before.		Before.		After.	Before.
Vaiśākha ...	1·40469	Bhādrapada ...	8·84122	...	...	...
Jyeshṭha ...	3·29438	Āśvina ...	9·75201	Phālguna ...	9·77912	10·06880
Āshāḍha ...	5·40851	Kārttika ...	10·11475	Chaitra ...	10·06880	10·89170
Śrāvaṇa ...	7·35320	...	...	...	...	...

Limits of Kshaya months.

	After	Before.
Margaśirsha ...	10·07446	10·11475
Pausha ...	9·86164	10·07447
Māgha ...	9·77910	9·86164
...	...	...

TABLE I (v).

Tithis.

Duration of tithis. Days.		Names of tithis.	Duration of tithis. Days.		Names of tithis.
0·98435	1	Śukla Pratipada.	15·74965	1	Krishna Prathama.
1·96870	2	Do. Dvitiya.	16·73400	2	Do. Dvitiya.
2·95306	3	Do. Tritiya.	17·71835	3	Do. Tritiva.
3·93741	4	Do. Chaturthi.	18·70270	4	Do. Chaturthi.
4·92176	5	Do. Panchami.	19·68706	5	Do. Panchami.
5·90612	6	Do. Shashṭhi.	20·67141	6	Do. Shashṭhi.
6·89047	7	Do. Saptami.	21·65576	7	Do. Saptami.
7·87482	8	Do. Ashtami.	22·64012	8	Do. Ashtami.
8·85918	9	Do. Navami.	23·62447	9	Do. Navami.
9·84353	10	Do. Daśami.	24·60882	10	Do. Daśami.
10·82788	11	Do. Ekādaśi.	25·59318	11	Do. Ekādaśi.
11·81223	12	Do. Dvādaśi.	26·57753	12	Do. Dvādaśi.
12·79659	13	Do. Trayodaśi.	27·56188	13	Do. Trayodaśi.
13·78094	14	Do. Chaturdaśi.	28·54623	14	Do. Chaturdaśi.
14·76529	15	Paurṇami.	29·53059	15	Amāyāsyā.

TABLE I (vi).

Nakshatras.					Yogas.		
Order and names of nakshatras.		Collective duration of nakshatras (equal space).	Deities presiding over nakshatras.	Duration of nakshatras (Garga).	Duration of nakshatras (Brahma).	Names of yogas.	Collective duration of yogas.
		Days.		Days.	Days.		Days.
1	Aśvinī	1·01191	Aśvin ...	1·01191	1·0	1 Vishkamba.	0·94149
2	Bharaṇī ...	2·02383	Yama ...	1·51787	1·5	2 Priti ...	1·88298
3	Kṛittikā (**Tam.** Kiruttigai).	3·03574	Agni ...	2·52978	2·5	3 Ayushmat ...	2·82447
4	Rohiṇī	4·04765	Prajāpati ...	4·04765	4·0	4 Saubhāgya.	3·76596
5	Mṛigaśiras (**Tam.** Mirugasiram).	5·05957	Soma ...	5·05956	5·0	5 Sobhana ...	4·70745
6	Ardrā (**Tam.** Arudrā or Tiruvadirai).	6·07148	Rudra ...	5·56552	5·5	6 Atigaṇḍa ...	5·64894
7	Punarvasu	7·08340	Aditi ...	7·08339	7·0	7 Sukarman ...	6·59043
8	Pushya (**Tam.** Pusam).	8·09531	Brihaspati ...	8·09531	8·0	8 Dhṛiti ...	7·53192
9	Aśleshā (**Tam.** Ayilyam).	9·10722	Sarpah ...	8·60126	8·5	9 Śula ...	8·47341
10	Māgha (**Tam.** Magham).	10·11914	Pitarah ...	9·61318	9·5	10 Gaṇḍa ...	9·41489
11	Pūrva-Phalgunī (**Tam.** Pūram).	11·13105	Bhaga ...	10·62510	10·5	11 Vriddhi ...	10·35638
12	Uttara-Phalgunī (**Tam.** Uttiram).	12·14297	Aryaman ...	12·14297	12·0	12 Dhṛuva ...	11·29787
13	Hasta (**Tam.** Hastam).	13·15488	Sāvitri ...	13·15488	13·0	13 Vyaghata ...	12·23936
14	Chaitrā (**Tam.** Chittirai).	14·16679	Tvashtri ...	14·16679	14·0	14 Harshana ...	13·18085
15	Svāti	15·17871	Vāyu ...	14·67275	14·5	15 Vajra ...	14·12234
16	Viśākhā (**Tam.** Visākam).	16·19062	Indrāgni ...	16·19062		16 Siddhi ...	15·06383
17	Anurādhā (**Tam.** Anusham).	17·20273	Mitra ...	17·20253	16·0 17·0	17 Vyatipāta ...	16·00532
18	Jyeshṭhā (**Tam.** Kettai).	18·21445	Indra ...	17·70849	17·5	18 Variyas ...	16·94681
19	Mūla (**Tam.** Mūlam).	19·22636	Nirriti ...	18·72040	18·5	19 Parigha ...	17·88830
20	Pūrva-Āshāḍha (**Tam.** Pūrādam).	20·23828	Apah ...	19·73232	19·5	20 Śiva ...	18·82979
21	Uttara-Āshāḍha (**Tam.** Uttirādam).	21·25019	Visvadēva	21·25019	21·0	21 Siddha ...	19·77128
			Brahma.		21·3217 (Abhijit)	22 Sadhya ...	20·71277
22	Śrāvaṇa (**Tam.** Tiruvonam).	22·26210	Vishnu ...	22·26210	22·3217	23 Subha ...	21·65426
23	Sravishta or Dhanishṭhā (**Tam.** Avittam).	23·27402	Vasava ...	23·27401	23·3217	24 Śukla ...	22·59575
24	Satabhisaj or Sataraka (**Tam.** Sadayam).	24·28593	Varuna ...	23·77997	23·8217	25 Brahman ...	23·53724
25	Pūrva-Bhādrapada (**Tam.** Pūrāttadi).	25·29785	Aja Ekapad.	24·79188	24·8217	26 Indra ...	24·47873
26	Uttara-Bhādrapada (**Tam.** Uttirattādi).	26·30976	Ahi Budhnya.	26·30975	26·3217	27 Vaidhriti ...	25·42022
27	Revatī	27·32167	Pushan ...	27·32167	27·8217		

TABLE I (vii).

Karaṇas.

Kimstughna	... 1,	
Bava	... 2, 9, 16, 23, 30, 37, 44, 51,	58 = Sakuni.
Balava	... 3, 10, 17, 24, 31, 38, 45, 52,	59 = Nāga.
Kaulava	... 4, 11, 18, 25, 32, 39, 46, 53,	60 = Chatushpada.
Taitila	... 5, 12, 19, 26, 33, 40, 47, 54,	
Gara	... 6, 13, 20, 27, 34, 41, 48, 55,	
Banija	... 7, 14, 21, 28, 35, 42, 49, 56,	
Vishti (or Bhadra).	8, 15, 22, 29, 36, 43, 50, 57,	

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Commencement of solar year. Month and day A.D.	Commencement of solar year. Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaiśākha. Week-day.	Vaiśākha. Month.	Vaiśākha. Day.	Vaiśākha. Fraction.	Jyeshṭha. Week-day.	Jyeshṭha. Month.	Jyeshṭha. Day.	Jyeshṭha. Fraction.	Āshāḍha. Week-day.	Āshāḍha. Month.	Āshāḍha. Day.	Āshāḍha. Fraction.	Śrāvaṇa. Week-day.	Śrāvaṇa. Month.	Śrāvaṇa. Day.	Śrāvaṇa. Fraction.	Bhādrapada. Week-day.	Bhādrapada. Month.	Bhādrapada. Day.	Bhādrapada. Fraction.
							B.C.																				
3101	57	...	13M	·9831	9·9981	22·736	1	3	Mr	23	·98	5	Ap	22	·51	7	My	22	·04	1	Je	20○	·57	3	Jl	20	·10
							A.D.																				
3102	58	...	14M	·2419	28·6370	20·870	1	2	Ap	11	·88	4	My	11	·41	5	Je	9●○	·94	7	Jl	9	.47	2	Au	8	·00
3103	59	...	14M	·5006	17·7453	17·027	2	7	Ap	1	·25	1	Ap	30○	·78	3	My	30	·31	4	Je	28	·84	6	Jl	28	·37
3104	60	...	14M	·7594	6·8536	13·184	3	4	Mr	21	·61	6	Ap	20○	·14	7	My	19	·67	2 Je	18	·20	5	Au	16	·27	
																				3 Jl	17	·73					
3105	61	...	14M	0181	25·4925	11·317	4	3	Ap	8●○	·51	5	My	8	·04	6	Je	6	·57	1	Jl	6	·10	2	Au	4	·63
3106	62	...	14M	·2769	14·6008	7·475	5	7	Mr	28●	·88	2	Ap	27	·41	3	My	26	·94	5	Je	25	·47	7	Jl	25	·00
3107	63	...	14M	·5356	3·7091	3·633	6	5	Mr	18	·24	6	Ap	16	·77	1 My	16	·31	4	Jl	14	·37	5	Au	12○	·90	
																2 Je	14	·84									
3108	64	...	14M	·7944	22·3479	1·765	7	4	Ap	6	·14	5	My	5	·67	7	Je	4	·20	1	Jl	3	·73	3	Au	2○	·26
3109	65	...	14M	·0531	11·4562	25·477	8	1	Mr	25	·51	3	Ap	24	·04	4	My	23	·57	6	Je	22	·10	7	Jl	21○	·63
3110	66	...	14M	·3119	0·5645	21·634	9	5 Mr	14	·88	1	My	12	·94	3	Je	11	·47	5	Jl	11●	·00	6	Au	9	·53	
								7 Ap	13	·41																	
3111	67	...	14M	·5707	19·2034	19·767	10	4	Ap	2	·77	6	My	2	·30	7	My	31○	·83	2	Je	30●	·37	3	Jl	29	·90
3112	68	...	14M	·8294	8·3117	15·925	11	2	Mr	23	·14	3	Ap	21	·67	5	My	21○	·20	6	Je	19	·73	1 Jl	19	·26	
																								2 Au	17	·79	
3113	69	...	14M	·0882	26·9506	14·058	12	1	Ap	10	·04	2	My	9●	·57	4	Je	8	·10	5	Jl	7	·63	7	Au	6	·16
3114	70	...	14M	·3469	16·0589	10·215	13	5	Mr	30○	·41	6	Ap	28●	·94	1	My	28	·47	3	Je	27	·00	4	Jl	26	·53
3115	71	...	14M	·6057	5·1672	6·373	14	2	Mr	19○	·77	4	Ap	18●	·30	5 My	17	·83	1	Jl	15	·89	3	Au	14	·43	
																7 Je	16	·36									
3116	72	...	14M	·8644	23·8061	4·506	15	1	Ap	7	·67	3	My	7	·20	4	Je	5	·73	6	Jl	5	·26	7	Au	3	·79
3117	73	...	14M	·1232	12·9144	0·663	16	6	Mr	27	·04	7	Ap	25	·57	2	My	25	·10	3	Je	23	·63	5	Jl	23	·16
3118	74	...	14M	·3820	2·0227	24·375	17	3	Mr	16	·40	4 Ap	14	·93	1	Je	13	·00	2	Jl	12○	·53	4	Au	11	·06	
												6 My	14	·47													
3119	75	...	14M	·5407	20·6616	22·508	18	2	Ap	4	·30	3	My	3	·83	5	Je	2	·36	6	Jl	1●○	·89	1	Jl	31	·42
3120	76	...	14M	·8995	9·7699	18·665	19	6	Mr	24	·67	1	Ap	23	·20	2	My	22	·73	4	Je	21●○	·26	5	Jl	20	·79
3121	77	...	14M	·1582	28·4088	16·799	20	5	Ap	11	·57	7	My	11○	·10	1	Je	9●	·63	3	Jl	9	·16	4	Au	7	·69
3122	78	...	14M	·4170	17·5171	12·956	21	2	Mr	31	·93	4	Ap	30○	·46	5	My	29	·99	7	Je	28	·53	2	Jl	28	·06
3123	79	...	14M	·6757	6·6254	9·113	22	7	Mr	21	·30	1	Ap	19●○	·83	3	My	19	·36	4 Je	17	·89	7	Au	15	·95	
																				6 Jl	17	·42					
3124	80	...	14M	·9345	25·2847	7·246	23	6	Ap	9	·20	7	My	8	·73	2	Je	7	·26	3	Jl	6	·79	5	Au	5	·32
3125	81	...	14M	·1932	14·3726	3·404	24	3	Mr	28	·57	5	Ap	27	·10	6	My	26	·63	1	Je	25	·16	2	Jl	24	·69
3126	82	...	14M	·4520	3·4809	27·115	25	7	Mr	17	·93	2	Ap	16	·46	3 My	15	·99	7	Jl	14	·05	1	Au	12○	·59	
																5 Je	14	·52									
3127	83	...	14M	·7108	22·1197	25·249	26	6	Ap	5	·83	1	My	5	·36	2	Je	3	·89	4	Jl	3	·42	5	Au	1○	·95
3128	84	...	14M	·9695	11·2280	21·406	27	4	Mr	26	·20	5	Ap	24	·73	7	My	24	·26	1	Je	22	·79	3	Jl	22●	·32
3129	85	...	14M	·2283	0·3363	17·563	28	1 Mr	14	·56	4	My	12	·63	6	Je	11○	·16	7	Jl	10●	69	2	Au	9	·22	
								3 Ap	13	·09																	
3130	86	...	14M	·4870	18·9752	15·696	29	7	Ap	2	·46	1	My	1	·99	3	My	31○	·52	5	Je	30	·05	6	Jl	29	·58
3131	87	...	14M	·7458	8·0835	11·854	30	4	Mr	22	·83	6	Ap	21	·36	7	My	20●○	·89	2	Je	19	·42	3 Jl	18	·95	
																								5 Au	17	·48	
3132	88	...	15M	·0045	26·7224	9·987	31	3	Ap	10○	·73	5	My	10●	·26	6	Je	8	·79	1	Jl	8	·32	2	Au	6	·85
3133	89	...	14M	·2633	15·8307	6·144	32	1	Mr	30○	·09	2	Ap	28●	·62	4	My	28	·15	5	Je	26	·69	7	Jl	26	·22
3134	90	...	14M	·5221	4·9390	2·301	33	5	Mr	19○	·46	6	Ap	17	·99	1 My	17	·52	4	Jl	15	·58	6	Au	14	·11	
																3 Je	16	·05									
3135	91	...	14M	·7808	23·5779	0·435	34	4	Ap	7	·36	5	My	6	·89	7	Je	5	·42	1	Jl	4	·95	3	Au	3	·48
3136	92	...	15M	·0396	12·6862	24·146	35	1	Mr	27	·73	3	Ap	26	·26	4	My	25	·79	6	Je	24	·32	7	Jl	23○	·85
3137	93	...	14M	·2983	1·7945	20·304	36	6	Mr	16	·09	7 Ap	14	·62	3	Je	12	·68	5	Jl	12●○	·21	6	Au	10	·75	
												2 My	14	·15													
3138	94	...	14M	·5571	20·4334	18·437	37	4	Ap	3	·99	6	My	3	·52	1	Je	2	·05	2	Jl	1●○	·58	4	Jl	31	·11
3139	95	...	14M	·8158	9·5417	14·594	38	2	Mr	24	·36	3	Ap	22	·89	5	My	22	·42	6	Je	20●	·95	1	Jl	20	·48
3140	96	...	15M	·0746	28·1806	12·727	39	1	Ap	12	·25	2	My	11○	·79	4	Je	10	·32	5	Jl	9	·85	7	Au	8	·38
3141	97	...	14M	·3334	17·2889	8·885	40	5	Mr	31	·62	7	Ap	30●○	·15	1	My	29	·68	3	Je	28	·21	4	Jl	27	·74
3142	98	...	14M	·5921	6·3972	5·043	41	2	Mr	20	·99	4	Ap	19●	·52	6	My	19	·05	7 Je	17	·58	3	Au	15	·64	
																				2 Jl	17	·11					
3143	99	...	14M	·8509	25·0361	3·175	42	1	Ap	8	·89	3	My	8	·42	4	Je	6	·95	6	Jl	6	·48	1	Au	5	·01
3144	100	...	15M	·1096	14·1443	26·887	43	6	Mr	29	·25	7	Ap	27	·78	2	My	27	·31	3	Je	25	·85	5	Jl	25	·38
3145	101	...	14M	·3684	3·2526	23·044	44	3	Mr	17	·62	5	Ap	16	·15	6 My	15	·68	2	Jl	13	·74	4	Au	12○	·27	
																1 Je	14	·21									
3146	102	...	14M	·6271	21·8915	21·178	45	2	Ap	5	·52	4	My	5	·05	5	Je	3	·58	7	Jl	3	·11	1	Au	1●	·64
3147	103	...	14M	·8859	10·9998	17·335	46	6	Mr	25	·88	1	Ap	24	·42	2	My	23	·95	4	Je	22○	·48	6	Jl	22●	·01
3148	104	...	15M	·1446	0·1081	13·493	47	4 Mr	15	·25	7	My	13	·31	1	Je	11○	·84	3	Jl	11	·37	4	Au	9	·91	
								5 Ap	13	·78																	
3149	105	...	14M	·4034	18·7470	11·625	48	3	Ap	2	·15	4	My	1	·68	6	My	31●○	·21	7	Je	29	·74	2	Jl	29	·27
3150	106	...	14M	·6822	7·8553	7·783	49	7	Mr	22	·52	2	Ap	21○	·05	3	My	20●	·58	5	Je	19	·11	6 Jl	18	·64	
																								1 Au	17	·17	
3151	107	...	14M	·9209	26·4942	5·916	50	6	Ap	10○	·41	7	My	9●	·95	2	Je	8	·48	4	Jl	8	·01	5	Au	6	·54
3152	108	...	15M	·1797	15·6025	2·073	51	3	Mr	30○	·78	5	Ap	29	·31	6	My	28	·84	1	Je	27	·37	2	Jl	26	·90
3153	109	...	14M	·4384	4·7108	25·785	52	1	Mr	19●	·15	2	Ap	17	·68	4 My	17	·21	7	Jl	15	·27	1	Au	13	·80	
																5 Je	15	·74									
3154	110	...	14M	·6972	23·3497	23·918	53	7	Ap	7	·05	1	My	6	·58	3	Je	5	·11	4	Jl	4	·64	6	Au	3○	·17
3155	111	...	14M	·9559	12·4580	20·075	54	4	Mr	27	·41	5	Ap	25	·94	7	My	25	·47	2	Je	24	·01	3	Jl	23●○	·54

• Ending moments of tithis by Ārya and Sūrya siddhāntas are the same.

from 1 B.C. to A.D. 500 (Sūrya siddhānta).*

Āśvina.				Kārttika.				Mārgaśīrsha.				Pausha.		A.D.	Māgha.			A.D.	Phālguna.			Chaitra.		
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.		Day.	Fraction.			Week-day.	Month.	Day.	Fraction.		
4	Au	18	·63																					
6	S	17	·16	7	O	16	·69	2	N	15	·23													
												Pausha. Kshaya.												
3	S	6	·53	5	O	6	·06	6	N	4	·59	1	D	4	·12									
7	Au	26	·90	2	S	25	·43	3	O	24○	·96	5	N	23●	·49									
6	S	14	·80	1	O	14○	·33	2	N	12	·86	4	D	12	·39									
4	S	3	·16	5	O	2○	·69	7	N	1	·22	1	N	30	·75									
1	Au	23	·53	3	S	22●	·06	4	O	21	·59	6	N	20	·12									
7	S	11●	·43	1	O	10	·96	3	N	9	·49	5	D	9	·02									
4	Au	31●	·79	6	S	30	·33	7	O	29	·86	2	N	28	·39									
2	Au	20	·16	3	S	18	·69	5	O	18	·22	6	N	16	·75									
1	S	8	·06	2	O	7	·59	4	N	6	·12	5	D	5○	·65									
5	Au	28	·43	6	S	26	·96	1	O	26	·49	3	N	25●○	·02									
4	S	16	·32	5	O	15	·85	7	N	14●○	·39	1	D	13	·92									
1	S	4	·69	3	O	4	·22	4	N	2	·75	6	D	2	·28									
6	Au	25	·06	7	S	23○	·59	2	O	23	·12	3	N	21	·65									
4	S	12○	·96	6	O	12	·49	1	N	11	·02	2	D	10	·55									
2	S	2●○	·32	3	O	1	·85	5	O	31	·38	6	N	29	·91									
6	Au	21●	·69	1	S	20	·22	2	O	19	·75	4	N	18	·28									
5	S	9	·59	7	O	9	·12	1	N	7	·65	3	D	7	·18									
2	Au	29	·95	4	S	28	·49	6	O	28	·02	7	N	26	·55									
7	Au	19	·32	3	O	17	·38	4	N	15	·91	6	D	15●	·44									
1	S	17	·85																					
6	S	6	·22	7	O	5	·75	2	N	4○	·28	3	D	3●	·81									
3	Au	26	·59	5	S	25	·12	6	O	24○	·65	1	N	23●	·18									
2	S	14	·48	4	O	14○	·01	5	N	12	·55	7	D	12	·08									
6	S	3	·85	1	O	3	·38	2	N	1	·91	4	D	1	·44									
4	Au	23○	·22	5	S	21●	·75	7	O	21	·28	1	N	19	·81									
3	S	11●	·12	4	O	10	·65	6	N	9	·18	7	D	8	·71									
7	Au	31	·48	2	S	30	·01	3	O	29	·54	5	N	28	·07									
4	Au	20	·85	6	S	19	·38	7	O	18	·91	2	N	17	·44									
3	S	7	·75	5	O	7	·28	6	N	5	·81	1	D	5○	·34									
1	Au	28	·11	2	S	26	·65	4	O	26	·18	5	N	24●○	·71									
7	S	16	·01	1	O	15	·54	3	N	14●	·07	4	D	13	·60									
4	S	5	·38	5	O	4○	·91	7	N	3	·44	1	D	2	·97									
1	Au	24	·75	3	S	23○	·28	4	O	22	·81	6	N	21	·34									
7	S	12●○	·64	2	O	12	·17	3	N	10	·71	5	D	10	·24									
5	S	2●	·01	6	O	1	·54	1	O	31	·07	2	N	29	·60									
2	Au	22	·38	3	S	20	·91	5	O	20	·44	6	N	18	·97									
1	S	9	·28	2	O	8	·81	4	N	7	·34	5	D	6	·87									
5	Au	29	·64	7	S	28	·17	1	O	27	·70	3	N	26	·23									
3	Au	19	·01	6	O	17	·07	7	N	15○	·60	2	D	15	·13									
4	S	17	·54																					
1	S	6	·91	3	O	6	·44	4	N	4○	·97	6	D	4●	·50									
6	Au	26	·27	7	S	24	·81	2	O	24○	·34	3	N	22	·87									
5	S	14	·17	6	O	13●	·70	1	N	12	·23	2	D	11	·76									
2	S	3○	·54	4	O	3●	·07	5	N	1	·60	7	D	1	·13									
6	Au	23○	·91	1	S	22	·44	2	O	21	·97	4	N	20	·50									
5	S	10	·80	7	O	10	·33	1	N	8	·87	3	D	8	·40									
3	Au	31	·17	4	S	29	·70	6	O	29	·23	7	N	27	·76									
7	Au	20	·54	2	S	19	·07	3	O	18	·60	5	N	17	·13									
6	S	8	·44	7	O	7	·97	2	N	6	·50	4	D	6○	·03									
3	Au	27	·80	5	S	26	·33	6	O	25	·86	1	N	24●	·39									
2	S	15	·70	4	O	15○	·23	5	N	13	·76	7	D	13	·29									
7	S	5	·07	1	O	4○	·60	3	N	3	·13	4	D	2	·66									
4	Au	25	·43	5	S	23●○	·97	7	O	23	·50	2	N	22	·03									
3	S	12	·33	4	O	11	·86	6	N	10	·39	7	D	9	·92									
7	S	1	·70	2	O	1	·23	3	O	30	·76	5	N	29	·29									
5	Au	22	·07	6	S	20	·60	1	O	20	·13	2	N	18	·66									
												3	D	14○	·76	1	5	Jr	13	·29	6	F	11	·82
																					1	Mr	13	·35
												2	Jr	2	·65		4	F	1	·18	5	Mr	2	·71
												7	D	23	·02	3	1	Jr	21	·55	3	F	20	·08
												5	Jr	10	·92		7	F	9	·45	1	Mr	9	·98
												3	D	30	·29	5	4	Jr	28	·82	6	F	27	·35
												7	D	19	·65	6	2	Jr	18	·18	3	F	16○	·71
												6	Jr	7	·55		1	F	6●○	·08	2	Mr	7	·61
												3	D	27	·92	8	5	Jr	26●○	·45	6	F	24	·98
												1	D	16	·28	9	2	Jr	14●	·81	4	F	13	·35
												7	Jr	4	·18		1	F	2	·71	3	Mr	4	·24
												4	D	24	·55	11	6	Jr	23	·08	7	F	21	·61
												3	Jr	12	·45		4	F	10	·98	6	Mr	11	·51
												7	D	31	·81	13	2	Jr	30	·84	3	F	28	·87
												5	D	21	·18	14	6	Jr	19	·71	1	F	18	·24
												4	Jr	9	·08		5	F	7	·61	7	Mr	9○	·14
												1	D	29	·45	16	2	Jr	27	·98	4	F	26	·51
												5	D	17	·81	17	7	Jr	16○	·34	1	F	14●	·87
												4	Jr	5○	·71		6	F	4	·24	7	Mr	5	·77
												2	D	26○	·08	19	3	Jr	24	·61	5	F	23	·14
												7	Jr	13	·97		2	F	12	·51	4	Mr	13	·04
												5	Jr	2	·34		6	Jr	31	·87	1	Mr	2	·40
												2	D	22	·71	22	4	Jr	21	·24	5	F	19	·77
												1	Jr	10	·61		3	F	9	·14	4	Mr	10	·67
												5	D	30	·97	24	7	Jr	29	·50	2	F	28○	·08
												3	D	19	·34	25	4	Jr	17	·87	6	F	16○	·40
												2	Jr	7	·24		3	F	5●○	·77	5	Mr	7	·30
												6	D	27	·61	27	1	Jr	26●	·14	2	F	24	·67
												3	D	16○	·97	28	5	Jr	15	·50	7	F	14	·03
												2	Jr	3	·87		4	F	2	·40	5	Mr	3	·93
												7	D	24	·24	30	1	Jr	22	·77	3	F	21	·30
												6	Jr	12	·13		7	F	10	·67	2	Mr	12	·20
												3	Jr	1	·50		5	Jr	31	·03	6	F	29	·56
												7	D	20	·87	33	2	Jr	19	·40	3	F	17	·93
												6	Jr	8	·77		1	F	7	·30	2	Mr	8●	·83
												4	D	29	·13	35	5	Jr	27○	·66	7	F	26	·19
												1	D	18	·50	36	3	Jr	17○	·03	4	F	15●	·56
												7	Jr	5○	·40		1	F	3	·93	3	Mr	5	·46
												4	D	25●	·77	38	6	Jr	24	·30	7	F	22	·83
												3	Jr	13	·66		5	F	12	·19	6	Mr	13	·72
												1	Jr	3	·03		2	F	1	·56	4	Mr	2	·09
												5	D	22	·40	41	6	Jr	20	·93	1	F	19	·46
												4	Jr	10	·29		5	F	8	·83	7	Mr	10○	·36
												1	D	30	·66	43	3	Jr	29	·19	4	F	27●○	·72
												6	D	20	·03	44	7	Jr	18	·56	2	F	17●○	·09
												4	Jr	6	·93		6	F	5	·46	7	Mr	6	·99
												2	D	27○	·29	46	3	Jr	25	·82	5	F	24	·35
												6	D	16●○	·66	47	1	Jr	15	·19	2	F	13	·72
												5	Jr	4	·56		7	F	3	·09	1	Mr	3	·62
												2	D	23	·93	49	4	Jr	22	·46	5	F	20	·99
												1	Jr	11	·82		3	F	10	·35	4	Mr	11	·88
												6	Jr	1	·19		7	Jr	30	·72	2	Mr	1	·25
												3	D	21	·56	52	5	Jr	20	·09	6	F	18	·62
												2	Jr	8	·45		3	F	6○	·99	5	Mr	8●	·52
												6	D	28	·82	54	1	Jr	27○	·35	2	F	25●	·88
												4	D	18	·19	55	5	Jr	16○	·72	7	F	15	·25

For tithis by Brahma siddhānta, add algebraically – ·02 to the above.

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Commencement of solar year. Month and day A.D.	Commencement of solar year. Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaiśākha. Week-day.	Vaiśākha. Month.	Vaiśākha. Day.	Vaiśākha. Fraction.	Jyeshṭha. Week-day.	Jyeshṭha. Month.	Jyeshṭha. Day.	Jyeshṭha. Fraction.	Āshāḍha. Week-day.	Āshāḍha. Month.	Āshāḍha. Day.	Āshāḍha. Fraction.	Śrāvaṇa. Week-day.	Śrāvaṇa. Month.	Śrāvaṇa. Day.	Śrāvaṇa. Fraction.	Bhādrapada. Week-day.	Bhādrapada. Month.	Bhādrapada. Day.	Bhādrapada. Fraction.
							A.D.																				
3156	112	...	15M	·2147	1·5663	16·233	55	1	Mr	16	·78	3	Ap	15	·31	6	Je	13	·37	7	Jl	12●○	·90	2	Au	11	·43
												4	My	14	·84												
3157	113	...	14M	·4735	20·2052	14·366	56	7	Ap	3	·68	2	My	3	·21	3	Je	1	·74	5	Jl	1●	·27	6	Jl	30	·80
3158	114	...	14M	·7322	9·3135	10·523	57	5	Mr	24	·05	6	Ap	22	·58	1	My	22○	·11	2	Je	20	·64	4	Jl	20	·17
3159	115	...	14M	·9910	27·9524	8·656	58	3	Ap	11	·94	5	My	11●○	·47	7	Je	10	·00	1	Jl	9	·53	3	Au	8	·07
3160	116	...	15M	·2497	17·0607	4·814	59	1	Ap	1	·31	2	Ap	30●	·84	4	My	30	·37	5	Je	28	·90	7	Jl	28	·43
3161	117	...	14M	·5085	6·1690	0·971	60	5	Mr	20○	·68	7	Ap	19	·21	1	My	18	·74	3	Je	17	·27	6	Au	15	·33
																				4	Jl	16	·80				
3162	118	...	14M	·7672	24·8078	26·859	61	4	Ap	8	·57	6	My	8	·11	7	Je	6	·64	2	Jl	6	·17	3	Au	4	·70
3163	119	...	15M	·0260	13·9161	22·816	62	1	Mr	28	·94	3	Ap	27	·47	5	My	27	·00	6	Je	25	·53	1	Jl	25	·06
3164	120	...	15M	·2848	3·0244	18·973	63	6	Mr	18	·31	7	Ap	16	·84	2	My	16	·37	5	Jl	14	·43	6	Au	12	·96
																3	Je	14	·90								
3165	121	...	14M	·5435	21·6633	17·107	64	5	Ap	5	·21	6	My	4	74	1	Je	3	·27	2	Jl	2○	·80	4	Au	1●	·33
3166	122	...	14M	·8023	10·7716	13·264	65	2	Mr	25	·57	4	Ap	24	·10	5	My	23	·63	7	Je	22○	·17	1	Jl	21	·70
3167	123	...	15M	·0610	29·4105	11·397	66	1	Ap	13	·47	3	My	13	·00	4	Je	11○	·53	6	Jl	11	·06	7	Au	9	·59
3168	124	...	15M	·3198	18·5188	7·554	67	5	Ap	2	·84	7	My	2○	·37	1	My	31●	·90	3	Je	30	·43	4	Jl	29	·96
3169	125	..	14M	·5785	7·6271	3·712	68	3	Mr	22	·21	4	Ap	20○	·74	6	My	20●	·27	7	Je	18	·80	3	Au	16	·86
																				2	Jl	18	·33				
3170	126	...	14M	·8373	26·2660	1·845	69	2	Ap	10○	·10	3	My	9	·63	5	Je	8	·16	6	Jl	7	·69	1	Au	6	·22
3171	127	...	15M	·0960	15·3743	25·557	70	6	Mr	30	·47	1	Ap	29	·00	2	My	28	·53	4	Je	27	·06	5	Jl	26	·59
3172	128	...	15M	·3548	4·4826	21·714	71	3	Mr	19●	·84	5	Ap	18	·37	6	My	17	·90	2	Jl	15	·96	4	Au	14○	·49
																1	Je	16	·43								
3173	129	...	14M	·6136	23·1215	19·847	72	2	Ap	6	·73	4	My	6	·27	5	Je	4	·80	7	Jl	4	·33	1	Au	2●○	·86
3174	130	...	14M	·8723	12·2298	16·004	73	7	Mr	27	·10	1	Ap	25	·63	3	My	25	·16	4	Je	23	·69	6	Jl	23●○	·22
3175	131	...	14M	·1311	1·3381	12·163	74	4	Mr	16	·47	6	Ap	15	·00	2	Je	13	·06	3	Jl	12●	·59	5	Au	11	·12
												7	My	14	·53												
3176	132	...	15M	·8898	19·9770	10·295	75	3	Ap	4	·37	4	My	3	·90	6	Je	2○	·43	7	Jl	1	·96	2	Jl	31	·49
3177	133	...	14M	·6486	9·0853	6·452	76	7	Mr	23	·78	2	Ap	22	·26	3	My	21●○	·79	5	Je	20	·33*	6	Jl	19	·86
3178	134	...	14M	·9073	27·7242	4·585	77	6	Ap	11	·63	1	My	11	·16	2	Je	9	·69	4	Jl	9	·22	5	Au	7	·72
3179	135	...	15M	·1661	16·8325	0·743	78	4	Ap	1○	·00	5	Ap	30●	·53	7	My	30	·06	1	Je	28	·59	3	Jl	28	·12
3180	136	1	15M	·4249	5·9408	24·455	79	1	Mr	21○	·36	2	Ap	19	·90	4	My	19	·43	5	Je	17	·96	2	Au	16	·02
																				7	Jl	17	·49				
3181	137	2	14M	·6836	24·5796	22·588	80	7	Ap	8	·26	1	My	7	·79	3	Je	6	·32	4	Jl	5	·85	6	Au	4	·39
3182	138	3	14M	·9424	13·6879	18·745	81	4	Mr	28	·63	6	Ap	27	·16	7	My	26	·69	2	Je	25	·22	3	Jl	24	·75
3183	139	4	15M	·2011	2·7962	14·902	82	2	Mr	18	·00	3	Ap	16	·53	6	Je	14	·59	1	Jl	14○	·12	2	Au	12●	·65
												5	My	16	·06												
3184	140	5	15M	·4599	21·4351	13·036	83	7	Ap	5	·89	2	My	5	·43	3	Je	3	·96	5	Jl	3○	·49	7	Au	2●	·02
3185	141	6	14M	·7186	10·5434	9·193	84	5	Mr	25	·26	6	Ap	23	·79	1	My	23	·32	2	Je	21○	·85	4	Jl	21	·38
3186	142	7	14M	·9774	29·1823	7·326	85	4	Ap	13	·16	5	My	12○	·69	7	Je	11●	·22	1	Jl	10	·75	3	Au	9	·28
3187	143	8	15M	·2362	18·2906	3·483	86	1	Ap	2	·53	3	My	2○	·06	4	My	31●	·59	6	Je	30	·12	7	Jl	29	·65
3188	144	9	15M	·4949	7·3989	27·195	87	5	Mr	22	·89	7	Ap	21○	·42	1	My	20	·95	3	Je	19	·48	6	Au	17	·55
																				5	Jl	19	·02				
3189	145	10	14M	·7537	26·0378	25·328	88	4	Ap	9●	·79	6	My	9	·32	7	Je	7	·85	2	Jl	7	·38	3	Au	5	·91
3190	146	11	15M	·0124	15·1481	21·486	89	2	Mr	30●	·16	3	Ap	28	·69	5	My	28	·22	6	Je	26	·75	1	Jl	26	·28
3191	147	12	15M	·2712	4·2544	17·643	90	6	Mr	19●	·52	1	Ap	18	·06	2	My	17	·59	5	Jl	15	·85	7	Au	14○	·18
																4	Je	16	·12								
3192	148	13	15M	·5299	22·8933	15·776	91	5	Ap	7	·42	6	My	6	·95	1	Je	5	·48	3	Jl	5	·01	4	Au	3●○	·54
3193	149	14	14M	·7887	12·0016	11·933	92	2	Mr	26	·79	4	Ap	25	·32	5	My	24	·85	7	Je	23	·38	1	Jl	22●	·91
3194	150	15	15M	·0474	1·1099	8·091	93	7	Mr	16	·16	3	My	14	·22	4	Je	12○	·75	6	Jl	12	·28	7	Au	10	·81
								1	Ap	14	·69																
3195	151	16	15M	·3062	19·7488	6·224	94	6	Ap	4	·05	7	My	3	·58	2	Je	2●○	·12	3	Jl	1	·65	5	Jl	31	·18
3196	152	17	15M	·5650	8·8571	2·381	95	3	Mr	24	·42	4	Ap	22	·95	6	My	22●○	·48	1	Je	21	·01	2	Jl	20	54
																								4	Au	19	·07
3197	153	18	14M	·8237	27·4959	0·514	96	2	Ap	11	·32	3	My	10●	·85	5	Je	9	·38	6	Jl	8	·91	1	Au	7	·44
3198	154	19	15M	0825	16·6042	24·226	97	6	Mr	31●○	·39	1	Ap	30	·22	2	My	29	·75	4	Je	28	·28	5	Jl	27	·81
3199	155	20	15M	·3412	5·7125	20·383	98	4	Mr	21●○	·05	5	Ap	19	·58	7	My	19	·11	1	Je	17	·64	4	Au	15	·71
																				3	Jl	17	·18				
3200	156	21	15M	·6000	24·3514	18·517	99	2	Ap	8	·95	4	My	8	·48	6	Je	7	·01	7	Jl	6	·54	2	Au	5	·07
3201	157	22	14M	·8587	13·4597	14·674	100	7	Mr	28	·32	1	Ap	26	·85	3	My	26	·38	4	Je	24	·91	6	Jl	24○	·44
3202	158	23	15M	·1175	2·5680	10·831	101	4	Mr	17	·68	6	Ap	16	·22	2	Je	14	·28	3	Jl	13○	·81	5	Au	12●	·34
												7	My	15	·75												
3203	159	24	15M	·8763	21·2069	8·064	102	8	Ap	5	·58	5	My	5	·11	6	Je	3	·64	1	Jl	3○	·17	2	Au	1	·70
3204	160	25	15M	·6350	10·3152	5·122	103	7	Mr	25	·95	2	Ap	24	·48	4	My	24	·01	5	Je	22●	·54	7	Jl	22	·07
3205	161	26	14M	·8938	28·9541	3·255	104	6	Ap	12	·85	1	My	12○	·38	2	Je	10●	·91	4	Jl	10	·44	5	Au	8	·97
3206	162	27	15M	·1525	18·0624	26·967	105	4	Ap	2	·21	5	My	1○	·74	7	My	31	·28	1	Je	29	·81	3	Jl	29	34
3207	163	28	15M	·4113	7·1707	23·124	106	1	Mr	22	·58	3	Ap	21●	·11	4	My	20	·64	6	Je	19	·17	2	Au	17	·23
																				7	Jl	18	·70				
3208	164	29	15M	·6700	25·8096	21·257	107	7	Ap	10●	·48	2	My	10	·01	3	Je	8	·54	5	Jl	8	·07	6	Au	6	·60
3209	165	30	14M	·9288	14·9179	17·415	108	4	Mr	28●	·85	6	Ap	28	·38	7	My	27	·91	2	Je	26	·44	3	Jl	25	·97

* Ending moments of titl is by Ārya and Sūrya siddhāntas are the same.

from 1 B.C. to A.D. 500 (Sūrya siddhānta)*—*cont.*

	Āśvina.				Kārttika.				Mārgaśīrsha.				Pausha.			A.D.	Māgha.				A.D.	Phālguna.				Chaitra.			
	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
	3	S	9	·96	5	O	9	·49	7	N	8	·03	1	D	7	·56													
	1	Au	29	·33	2	S	27	·86	4	O	27	·39	5	N	25○	·92													
{	5	Au	18	·70																									
{	7	S	17	·23	1	O	16	·76	3	N	15○	·29	4	D	14	·82													
	4	S	6	·60	6	O	6	·13	7	N	4○	·66	2	D	4	·19													
	1	Au	26	·96	3	S	25	·49	5	O	25	·02	6	N	23	·55													
	7	S	13○	·86	2	O	13●	·39	8	N	11	·92	5	D	11	·45													
	5	S	3○	·23	6	O	2●	·76	1	N	1	·29	2	N	30	·82													
	2	Au	23○	·59	4	S	22	·13	5	O	21	·66	7	N	20	·19													
	1	S	11	·49	3	O	11	·02	4	N	9	·55	6	D	9	·08													
	5	Au	30	·86	7	S	29	·39	1	O	28	·92	3	N	27	·45													
	3	Au	20	·23	4	S	18	·76	6	O	18	·29	7	N	16	·82													
	2	S	8	·12	3	O	7	·65	5	N	6	·19	6	D	5	·72													
	6	Au	28	·49	1	S	27	·02	2	O	26○	·55	4	N	25	·08													
	5	S	15	·39	6	O	14○	·92	1	N	13	·45	2	D	12	·98													
	2	S	4	·76	4	O	4●○	·29	5	N	2	·82	7	D	2	·35													
	7	Au	25	·12	1	S	23●	·65	3	O	23	·18	4	N	21	·71													
	6	S	13	·02	7	O	12	·55	2	N	11	·08	3	D	10	·61													
	3	S	1	·39	4	S	30	·92	6	O	30	·45	7	N	28	·98													
	7	Au	21	·75	2	S	20	·29	3	O	19	·82	5	N	18	·35													
	6	S	9	·65	1	O	9	·18	2	N	7	·71	4	D	7○	·24													
	4	Au	30	·02	5	S	28	·55	7	O	28	·08	1	N	26○	·61													
{	1	Au	18	·39																									
{	2	S	16	·92	4	O	16	·45	5	N	14○	·98	7	D	14	·51													
	7	S	6	·28	1	O	5	·81	3	N	4	·35	4	D	3	·88													
	4	Au	26	·65	6	S	25○	·18	7	O	24●	·71	2	N	23	·24													
	3	S	14○	·55	5	O	14●	·08	6	N	12	·61	1	D	12	·14													
	7	S	2○	·92	2	O	2	·45	3	O	31	·98	5	N	30	·51													
	5	Au	23●	·28	6	S	21	·81	1	O	21	·34	2	N	19	·87													
	4	S	11	·18	5	O	10	·71	7	N	9	·24	1	D	8	·77													
	1	Au	31	·55	3	S	30	·08	4	O	29	·61	6	N	28	·14													
	5	Au	19	.91	7	S	18	·45	1	O	17	·98	3	N	16	·51													
	4	S	7	·81	6	O	7	·34	7	N	5○	·87	2	D	5	·40													
	2	Au	28	·18	3	S	26	·71	5	O	26○	·24	6	N	24	·77													
	1	S	16	·08	2	O	15●○	·61	4	N	14	·14	5	D	13	·67													
	5	S	4	·44	6	O	3●	·97	1	N	2	·50	3	D	2	·04													
	2	Au	24○	·81	4	S	23	·34	5	O	22	·87	7	N	21	·40													
	1	S	12	·71	3	O	12	·24	4	N	10	·77	6	D	10	·80													
	6	S	2	·08	7	O	1	·61	2	O	31	·14	3	N	29	·67													
	3	Au	21	·44	4	S	19	·97	6	O	19	·50	1	N	18	·03													
	2	S	9	·34	3	O	8	·87	5	N	7	·40	6	D	6○	·93													
	6	Au	29	·71	1	S	28	·24	2	O	27	·77	4	N	26○	·30													
	5	S	17	·60	7	O	17	·14	1	N	15	·67	3	D	15	·20													
	2	S	5	·97	4	O	5○	·50	6	N	4●	·03	7	D	3	·56													
	7	Au	26	·34	1	S	24○	·87	3	O	24	·40	4	N	22	·93													
	6	S	14○	·24	7	O	13	·77	2	N	12	·30	3	D	11	·83													
	3	S	3●	·60	5	O	3	·13	6	N	1	·66	1	D	1	·20													
	7	Au	22●	·97	2	S	21	·50	4	O	21	·03	5	N	19	·56													
	6	S	10	·87	1	O	10	·40	2	N	8	·93	4	D	8	·46													
	4	Au	31	·24	5	S	29	·77	7	O	29	·30	1	N	27	·83													
	1	Au	20	·60	3	S	19	·13	4	O	18	·66	6	N	17○	·19													
	7	S	7	·50	2	O	7	·03	3	N	5○	·56	5	D	5	·09													
	4	Au	27	·87	6	S	26	·40	7	O	25●○	·93	2	N	24	·46													
	3	S	15	·76	5	O	15	·30	6	N	13	·83	1	D	13	·36													
	1	S	5○	·13	2	O	4	·66	4	N	3	·19	5	D	2	·72													
	5	Au	24●○	·50	7	S	23	·03	1	O	22	·56	3	N	21	·09													
56	3	Jr	6	·09														4	F	4	·62	6	Mr	5	·15				
	7	D	25●	·45													**57**	1	Jr	23	·98	3	F	22	·51				
58	6	Jr	13	·35														7	F	11	·88	2	Mr	13	·41				
59	3	Jr	2	·72														5	F	1	·25	6	Mr	2	·78				
	1	D	23	·09													**60**	2	Jr	21	·62	4	F	20	·15				
61	6	Jr	9	·98														1	F	8	·51	3	Mr	10●○	·04				
	4	D	30	·35													**62**	5	Jr	28	·88	7	F	27●○	41				
	1	D	19	·72													**63**	3	Jr	18	·25	4	F	16●	·78				
64	7	Jr	7○	·61														2	F	6	·15	3	Mr	6	·68				
	4	D	26○	·98													**65**	6	Jr	25	·51	1	F	24	·04				
	2	D	16●○	·35													**66**	3	Jr	14	·88	{ 5	F	13	·41				
																						{ 6	Mr	14	·94				
67	1	Jr	4	·25														2	F	2	·78	4	Mr	4	·81				
	5	D	24	·61													**68**	7	Jr	23	·14	1	F	21	·67				
69	4	Jr	11	·51														6	F	10	·04	7	Mr	11	·5				
	1	D	31	·88													**70**	3	Jr	30	·41	4	F	28	·94				
	6	D	21	·25													**71**	7	Jr	19	·78	2	F	18○	·31				
72	5	Jr	9	·14														6	F	7○	·67	1	Mr	8	·20				
	2	D	28	·51													**73**	4	Jr	27○	·04	5	F	25	·57				
	6	D	17	·88													**74**	1	Jr	16	·41	2	F	14	·94				
75	5	Jr	5●	·77														7	F	4	·31	1	Mr	5	·84				
	3	D	26●	·14													**76**	4	Jr	24	·67	6	F	23	·20				
77	2	Jr	13	·04														3	F	11	·57	5	Mr	13	·10				
78	6	Jr	2	·41														7	Jr	31	·94	2	Mr	2	·47				
	3	D	22	·77													**79**	5	Jr	21	·30	6	F	19	·83				
80	2	Jr	10	·67														4	F	9	·20	5	Mr	9●○	·73				
	7	D	30	·04													**81**	1	Jr	28	·57	3	F	27●	·10				
	4	D	19	·41													**82**	5	Jr	17○	·94	7	F	16	·47				
83	3	Jr	7○	·30														4	F	5	·83	6	Mr	7	·36				
	7	D	27●○	·67													**84**	2	Jr	26	·20	3	F	24	·73				
	5	D	16●	·04													**85**	6	Jr	14	·57	{ 1	F	13	·10				
																						{ 2	Mr	14	·6				
86	3	Jr	3	·93														5	F	2	·46	7	Mr	4	·00				
	1	D	24	·30													**87**	2	Jr	22	·83	4	F	21	·86				
88	7	Jr	12	·20														1	F	10	·73	3	Mr	11	·26				
	4	D	31	·57													**89**	6	Jr	30	·10	7	F	28○	·63				
	1	D	20	·93													**90**	3	Jr	19	·46	4	F	17○	·99				
91	7	Jr	8	·83														2	F	7○	·36	3	Mr	8	·89				
	5	D	29	·20													**92**	6	Jr	27●	·73	1	F	26	·26				
	2	D	17○	·56													**93**	4	Jr	16	·10	5	F	14	·63				
94	1	Jr	5●	·46														2	F	3	·99	4	Mr	5	·52				
	5	D	25	·83													**95**	7	Jr	24	·36	1	F	22	·89				
96	4	Jr	13	·73														6	F	12	·26	7	Mr	12	·79				
97	2	Jr	2	·09														3	Jr	31	·62	5	Mr	2	·18				
	6	D	22	·46													**98**	7	Jr	20	·99	2	F	19	·52				
99	5	Jr	10	·36														6	F	8	·89	1	Mr	10	·42				
	2	D	30	·73													**100**	4	Jr	29○	·26	5	F	27	·79				
	7	D	19	·09													**01**	1	Jr	17●○	·62	3	F	16	·15				
02	5	Jr	6○	·99														7	F	5	·52	2	Mr	7	·05				
	3	D	27●	36													**03**	4	Jr	25	·89	6	F	24	·42				
	7	D	16	·72													**04**	2	Jr	15	·26	{ 3	F	13	·79				
																						{ 5	Mr	14	·32				
05	6	Jr	3	·62														1	F	2	·15	2	Mr	3	·68				
	3	D	23	·99													**06**	5	Jr	22	·52	7	F	21	·05				
07	2	Jr	11	·89														4	F	10	·42	5	Mr	11○	·95				
08	7	Jr	1	·25														1	Jr	30	·78	3	F	29○	·32				
	4	D	20	·62													**09**	6	Jr	19	·15	7	F	17○	·68				

For tithis by Brahma siddhānta add algebraically —·02 to the above.

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Commencement of solar year. Month and day A.D.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era. A.D.	Vaiśākha. Week-day.	Month.	Day.	Fraction.	Jyeshṭha. Week-day.	Month.	Day.	Fraction.	Āshāḍha. Week-day.	Month.	Day.	Fraction.	Śrāvaṇa. Week-day.	Month.	Day.	Fraction.	Bhādrapada. Week-day.	Month.	Day.	Fraction.
3210	166	31	15M	·1876	4·0262	13·572	**109**	2	Mr	19	·21	3	Ap	17	·74	5	My	17	·27								
																6	Je	15	·80	1	Jl	15	·34	2	Au	13●	○·87
3211	167	32	15M	·4463	22·6651	11·705	**110**	1	Ap	7	·11	2	My	6	·64	4	Je	5	·17	5	Jl	4	·70	7	Au	3●	·23
3212	168	33	15M	·7051	11·7738	7·862	**111**	5	Mr	27	·48	7	Ap	26	·01	1	My	25	·54	3	Je	24○	·07	4	Jl	23	·60
3213	169	34	14M	·9638	0·8817	4·020	**112**	2	Mr	15	·84																
								4	Ap	14	·38	5	My	13	·91	7	Je	12●○	·44	1	Jl	11	·97	3	Au	10	·50
3214	170	35	15M	·2226	19·5206	2·153	**113**	1	Ap	3	·74	3	My	3	·27	4	Je	1●○	·80	6	Jl	1	·33	7	Jl	30	·86
3215	171	36	15M	·4813	8·6289	25·865	**114**	6	Mr	24	·11	7	Ap	22	·64	2	My	22●	·17	3	Je	20	·70	5	Jl	20	·23
																								6	Au	18	·76
3216	172	37	15M	·7401	27·2677	23·998	**115**	5	Ap	12○	·01	6	My	11	·54	1	Je	10	·07	2	Jl	9	·60	4	Au	8	·13
3217	173	38	14M	·9088	16·3760	20·155	**116**	2	Mr	31●○	·37	3	Ap	29	·90	5	My	29	·44	6	Je	27	·97	1	Jl	27	·50
3218	174	39	15M	·2576	5·4843	16·312	**117**	6	Mr	20●	·74	1	Ap	19	·27	2	My	18	·80	4	Je	17	·33				
																				5	Jl	16	·86	7	Au	15	·39
3219	175	40	15M	·5164	24·1232	14·446	**118**	5	Ap	8	·64	7	My	8	·17	1	Je	6	·70	3	Jl	6	·23	4	Au	4○	·76
3220	176	41	15M	·7751	13·2315	10·603	**119**	3	Mr	29	·01	4	Ap	27	·54	6	My	27	·07	7	Je	25	·60	2	Jl	25○	·13
3221	177	42	15M	·0339	2·3398	6·760	**120**	7	Mr	17	·37	1	Ap	15	·90												
												3	My	15	·43	4	Je	13	·96	6	Jl	13○	·50	1	Au	12	·03
3222	178	43	15M	·2926	20·9787	4·893	**121**	6	Ap	5	·27	7	My	4	·80	2	Je	3	·33	3	Jl	2●	·86	5	Au	1	·39
3223	179	44	15M	·5514	10·0870	1·051	**122**	3	Mr	25	·64	5	Ap	24	·17	6	My	23○	·70	1	Je	22●	·23	2	Jl	21	·76
3224	180	45	15M	·8101	28·7259	26·739	**123**	2	Ap	13	·54	4	My	13○	·07	5	Je	11	·60	7	Jl	11	·13	1	Au	9	·66
3225	181	46	15M	·0689	17·8342	22·896	**124**	6	Ap	1	·90	1	My	1●	·43	2	My	30	·96	4	Jo	29	·49	6	Jl	29	·02
3226	182	47	15M	·3277	6·9425	19·053	**125**	4	Mr	22○	·28	5	Ap	20●	·80	7	My	20	·33	1	Je	18	·86				
																				8	Jl	18	·39	4	Au	16	·92
3227	183	48	15M	·5864	25·5814	17·176	**126**	3	Ap	10●	·17	4	My	9	·70	6	Je	8	·23	7	Jl	7	·76	2	Au	6	·29
3228	184	49	15M	·8452	14·6897	13·344	**127**	7	Mr	30	·53	2	Ap	29	·06	3	My	28	·60	5	Je	27	·13	6	Jl	26	·66
3229	185	50	15M	·1039	3·7980	9·501	**128**	4	Mr	18	·90	6	Ap	17	·43	7	My	16	·96								
																2	Je	15	·49	4	Jl	15	·02	5	Au	13	·55
3230	186	51	15M	·3627	22·4369	7·634	**129**	3	Ap	6	·80	5	My	6	·33	6	Je	4	·86	1	Jl	4○	·39	2	Au	2	·92
3231	187	52	15M	·6214	11·5452	3·791	**130**	1	Mr	27	·17	2	Ap	25	·70	4	My	25	·23	5	Je	23●○	·76	7	Jl	23	·29
3232	188	53	15M	·8802	0·6535	27·503	**131**	5	Mr	16	·53																
								7	Ap	15	·06	1	My	14	·59	3	Je	13●○	·12	4	Jl	12	·66	6	Au	11	·19
3233	189	54	15M	·1389	19·2923	25·636	**132**	4	Ap	3	·43	5	My	2	·96	7	Je	1●	·49	2	Jl	1	·02	3	Jl	30	·55
3234	190	55	15M	·3977	8·4006	21·794	**133**	1	Mr	23	·80	3	Ap	22○	·33	4	My	21	·86	6	Je	20	·39	7	Jl	19	·92
																								2	Au	18	·45
3235	191	56	15M	·6565	27·0395	19·927	**134**	7	Ap	11●○	·70	2	My	11	·23	3	Je	9	·76	5	Jl	9	·29	6	Au	7	·82
3236	192	57	15M	·9152	16·1478	16·084	**135**	5	Ap	1●○	·06	6	Ap	30	·59	1	My	30	·12	2	Je	28	·65	4	Jl	28	·18
3237	193	58	15M	·1740	5·2561	12·241	**136**	2	Mr	20	·43	3	Ap	18	·96	5	My	18	·49	7	Je	17	·02				
																				1	Jl	16	·55	3	Au	15○	·08
3238	194	59	15M	·4327	23·8950	10·875	**137**	1	Ap	8	·33	2	My	7	·86	4	Je	6	·39	5	Jl	5	·92	7	Au	4○	·45
3239	195	60	15M	·6915	13·0033	6·532	**138**	5	Mr	28	·69	7	Ap	27	·22	1	My	26	·76	3	Je	25	·29	4	Jl	24○	·82
3240	196	61	15M	·9502	2·1116	2·689	**139**	3	Mr	18	·06	4	Ap	16	·59												
												6	My	16	·12	7	Je	14	·65	2	Jl	14	·18	3	Au	12	·71
3241	197	62	15M	·2090	20·7505	0·822	**140**	1	Ap	4	·96	3	My	4	·49	5	Je	3○	·02	6	Jl	2●	·55	1	Au	1	·08
3242	198	63	15M	·4678	9·8589	24·534	**141**	6	Mr	25	·33	7	Ap	23	·86	2	My	23○	·39	3	Je	21●	·92	5	Jl	21	·45
3243	199	64	15M	·7265	28·4977	22·667	**142**	5	Ap	13	·22	6	My	12●○	·75	1	Je	11	·28	2	Jl	10	·82	4	Au	9	·35
3244	200	65	15M	·9853	17·6060	18·825	**143**	2	Ap	2○	·59	4	My	2●	·12	5	My	31	·65	7	Je	30	·18	1	Jl	29	·71
3245	201	66	15M	·2140	6·7143	14·982	**144**	6	Mr	21○	·96	1	Ap	20●	·49	3	My	20	·02	4	Je	18	·55				
																				6	Jl	18	·08	7	Au	16	·61
3246	202	67	15M	·5028	25·3532	13·115	**145**	5	Ap	9	·86	7	My	9	·39	1	Je	7	·92	3	Jl	7	·45	4	Au	5	·98
3247	203	68	15M	·7815	14·4615	9·272	**146**	3	Mr	30	·22	4	Ap	28	·75	6	My	28	·28	7	Je	26	·81	2	Jl	26	·34
3248	204	69	16M	·0203	3·5698	5·430	**147**	7	Mr	19	·59	2	Ap	18	·12												
												3	My	17	·65	5	Je	16	·18	6	Jl	15○	·71	1	Au	14	·24
3249	205	70	15M	·2791	22·2087	3·563	**148**	6	Ap	6	·49	1	My	6	·02	2	Je	4	·55	4	Jl	4●○	·08	5	Au	2	·61
3250	206	71	15M	·5378	11·3170	27·275	**149**	3	Mr	26	·85	5	Ap	25	·38	6	My	24	·92	1	Je	23●○	·45	2	Jl	22	·98
3251	207	72	15M	·7966	0·4253	23·432	**150**	1	Mr	16	·22																
								2	Ap	14	·75	4	My	14	·28	5	Je	12●	·81	7	Jl	12	·34	1	Au	10	·87
3252	208	73	16M	·0553	19·0641	21·565	**151**	7	Ap	4	·12	1	My	3○	·65	3	Je	2	·18	4	Jl	1	·71	6	Jl	31	·24
3253	209	74	15M	·3141	8·1724	17·723	**152**	4	Mr	23	·49	6	Ap	22●○	·02	7	My	21	·55	2	Je	20	·08	3	Jl	19	·61
																								5	Au	18	·14
3254	210	75	15M	·5728	26·8113	15·856	**153**	3	Ap	11●○	·38	4	My	10	·91	6	Je	9	·44	7	Jl	8	·98	2	Au	7	·51
3255	211	76	15M	·8316	15·9196	12·013	**154**	7	Mr	31●	·75	2	Ap	30	·28	3	My	29	·81	5	Je	28	·34	6	Jl	27	·87
3256	212	77	16M	·0904	5·0279	8·170	**155**	5	Mr	21	·12	6	Ap	19	·65	1	My	19	·18								
																2	Je	17	·71	4	Jl	17	·24	5	Au	15○	·77
3257	213	78	15M	·3491	23·8668	6·304	**156**	4	Ap	8	·02	5	My	7	·55	7	Je	6	·08	1	Jl	5	·61	3	Au	4○	·14
3258	214	79	15M	·6079	12·7751	2·461	**157**	1	Mr	28	·38	2	Ap	26	·91	4	My	26	·44	5	Je	24●	·97	7	Jl	24	·50
3259	215	80	15M	8666	1·8834	26·173	**158**	5	Mr	17	·75	7	Ap	16	·28												
												1	My	15	·81	3	Je	14○	·34	4	Jl	13●	·87	6	Au	12	·40
3260	216	81	16M	·1254	20·5223	24·306	**159**	4	Ap	5	·65	6	My	5	·18	7	Je	3○	·71	2	Jl	3	·24	3	Au	1	·77
3261	217	82	15M	·3841	9·6306	20·463	**160**	2	Mr	25	·01	3	Ap	23	·54	5	My	23●○	·07	6	Je	21	·61	1	Jl	21	·14
3262	218	83	15M	·6429	28·2695	18·596	**161**	7	Ap	12	·91	2	My	12●	·44	3	Je	10	·97	5	Jl	10	·50	7	Au	9	·08

• Ending moment of tithis are the same for Ārya and Sūrya siddhāntas.

from 1 B.C. to A.D. 500 (Sūrya siddhānta)*—*cont.*

Āśvina.				Kārttika.				Mārgaśīrsha.				Pausha.			A.D.	Māgha.			A.D.	Phālguna.				Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.		Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
4	S	12	·40	5	O	11	·93	7	N	10	·46	1	D	9	·99												
1	S	1	·76	3	O	1	·29	4	O	30	·82	6	N	29	·36												
6	Au	22	·13	7	S	20	·66	2	O	20	·19	3	N	18	·72												
5	S	9	·03	6	O	8	·56	1	N	7	·09	2	D	6○	·62												
2	Au	29	·40	3	S	27	·93	5	O	27	·46	6	N	25●	·99												
1	S	17	·29	2	O	16○	·82	4	N	15●	·35	5	D	14	·88												
5	S	6	·66	7	O	6○	·19	1	N	4●	·72	3	D	4	·25												
3	Au	26	·03	4	S	24○	·56	6	O	24	·09	7	N	22	·62												
1	S	13	·92	3	O	13	·46	4	N	11	·99	6	D	11	·52												
6	S	3●	·29	7	O	2	·82	2	N	1	·35	3	N	30	·88												
3	Au	23	·66	5	S	22	·19	6	O	21	·72	1	N	20	·25												
2	S	10	·56	4	O	10	·09	5	N	8	·62	7	D	8	·15												
6	Au	30	·92	1	S	29	·45	2	O	28	·98	4	N	27○	·52												
4	Au	20	·29	7	O	18	·35	Mārgaśīrsha Kshayā.				1	N	16○	·88												
				5	S	18	·82																				
3	S	8	·19	4	O	7	·72	6	N	6●○	·25	7	D	5	·78												
7	Au	27	·56	2	S	26	·09	3	O	25●	·62	5	N	24	·15												
6	S	15○	·45	7	O	14	·98	2	N	13	·51	4	D	13	·04												
3	S	4●○	·82	5	O	4	·35	6	N	2	·88	1	D	2	·41												
1	Au	25●○	·19	2	S	23	·72	4	O	23	·25	5	N	21	·78												
7	S	12	·08	1	O	11	·62	3	N	10	·15	4	D	9	·68												
4	S	1	·45	5	S	30	·98	7	O	30	·51	2	N	29	·04												
1	Au	21	·82	3	S	20	·35	4	O	19	·88	6	N	18	·41												
7	S	9	·72	2	O	9	·25	3	N	7	·78	5	D	7	·31												
5	Au	29	·08	6	S	27	·61	1	O	27○	·14	2	N	25●	·68												
3	S	16	·98	5	O	16○	·51	7	N	15●	·04	1	D	14	·57												
1	S	6	·35	2	O	5○	·88	4	N	4	·41	5	D	3	·94												
5	Au	26	·72	7	S	25●	·25	1	O	24	·78	3	N	23	·31												
4	S	13●	·61	6	O	13	·14	7	N	11	·67	2	D	11	·20												
1	S	2●	·98	3	O	2	·51	5	N	1	·04	6	N	30	·57												
6	Au	23	·35	7	S	21	·88	2	O	21	·41	3	N	19	·94												
5	S	11	·24	6	O	10	·78	1	N	9	·31	2	D	8○	·84												
2	Au	30	·61	4	S	29	·14	5	O	28	·67	7	N	27○	·20												
6	Au	19	·98	8	O	18	·04	Mārgaśīrsha Kshaya.				4	N	16●○	·57												
1	S	18	·51																								
5	S	7	·88	7	O	7	·41	1	N	5●	·94	3	D	5	·47												
3	Au	28	·24	4	S	26○	·77	6	O	26	·30	7	N	24	·84												
2	S	15○	·14	3	O	14	·67	5	N	13	·20	6	D	12	·73												
6	S	4●○	·51	1	O	4	·04	2	N	2	·57	4	D	2	·10												
3	Au	24●	·88	5	S	23	·41	6	O	22	·94	1	N	21	·47												
2	S	12	·77	4	O	12	·30	5	N	10	·83	7	D	10	·36												
7	S	1	·14	1	S	30	·67	3	O	30	·20	4	N	28	·73												
4	Au	21	·51	7	S	20	·04	7	O	19	·57	2	N	18	·10												
3	S	9	·40	4	O	8	·94	6	N	7○	·47	1	D	7●	·00												
7	Au	29	·77	2	S	28	·30	3	O	27○	·83	5	N	26●	·36												
6	S	16	·67	1	O	16○	·20	2	N	14	·73	4	D	14	·26												
4	S	6	·04	5	O	5	·57	7	N	4	·10	1	D	3	·63												
1	Au	26○	·40	2	S	24●	·93	4	O	24	·46	6	N	23	·00												
7	S	14●	·30	1	O	13	·83	3	N	12	·36	4	D	11	·89												
4	S	2	·67	6	O	2	·20	7	O	31	·73	2	N	30	·26												
2	Au	23	·04	3	S	21	·57	5	O	21	·10	6	N	19	·63												
7	S	10	·93	2	O	10	·46	3	N	8	·99	5	D	8○	·52												
5	Au	31	·30	6	S	29	·83	1	O	29	·36	2	N	27○	·89												
2	Au	19	·67	5	O	17	·73	7	N	16	·26	1	D	15	·79												
4	S	18	·20																								
1	S	7	·56	3	O	7○	·10	4	N	5	·63	6	D	5	·16												
																10	3	Jr	8	·52							
																	7	D	28○	·89							
																	5	D	18○	·25							
																13	4	Jr	5	·15							
																	1	D	25	·52							
																15	7	Jr	13	·42							
																16	4	Jr	2	·78							
																	2	D	22	·15							
																18	1	Jr	10	·05							
																	5	D	30	·41							
																	2	D	19	·78							
																21	1	Jr	6	·68							
																	6	D	27	·05							
																	3	D	16	·41							
																24	2	Jr	4	·31							
																	6	D	23	·68							
																26	5	Jr	11	·58							
																	2	D	31	·94							
																	7	D	21	·31							
																29	6	Jr	8○	·21							
																	3	D	28○	·57							
																	7	D	17○	·94							
																32	6	Jr	5	·84							
																	4	D	25	·21							
																34	3	Jr	13	·10							
																35	7	Jr	2	·47							
																	4	D	22	·84							
																37	3	Jr	9	·74							
																	1	D	30	·10							
																	5	D	19	·47							
																40	4	Jr	7	·37							
																	1	D	26	·73							
																	6	D	16	·10							
																43	5	Jr	4	·00							
																	2	D	24	·37							
																45	1	Jr	11	·26							
																	5	D	31	·63							
																	3	D	21	·00							
																48	1	Jr	8○	·90							
																	6	D	28○	·26							
																	3	D	17	·63							
																51	2	Jr	5	·53							
																	6	D	25	·89							
																53	5	Jr	12	·79							
																54	3	Jr	2	·16							
																	7	D	22	·53							
																56	6	Jr	10	·42							
																	3	D	29	·79							
																	1	D	19○	·16							
																59	7	Jr	7	·06							
																	4	D	27	·42							
																61	3	Jr	14	·32							
																62	7	Jr	3	·69							
																	5	F	7	·05	6	Mr	8	·58			
																11	2	Jr	27●	·42	3	F	25	·95			
																12	6	Jr	16	·78	1	F	15	·31			
																	5	F	3	·68	7	Mr	5	·21			
																14	3	Jr	24	·05	4	F	22	·58			
																	1	F	11	·95	3	Mr	13	·48			
																	6	F	1	·31	7	Mr	1	·84			
																17	3	Jr	20	·68	5	F	19	·21			
																	2	F	8○	·58	4	Mr	10	·10			
																19	6	Jr	28○	·94	1	F	27	·48			
																20	4	Jr	18●○	·31	5	F	16	·84			
																	3	F	5	·21	4	Mr	6	·74			
																22	7	Jr	25	·58	2	F	24	·11			
																23	4	Jr	14	·94	6	F	13	·47			
																					1	Mr	15	·06			
																	3	F	2	·84	5	Mr	3	·37			
																25	1	Jr	22	·21	2	F	20	·74			
																	7	F	10	·11	1	Mr	11○	·64			
																27	4	Jr	30	·47	6	Mr	1○	·00			
																28	1	Jr	19	·84	3	F	18	·37			
																	7	F	6●	·74	2	Mr	8	·27			
																30	5	Jr	27●	·10	6	F	25	·64			
																31	2	Jr	16	·47	4	F	15	·00			
																	1	F	4	·37	2	Mr	4	·90			
																33	5	Jr	28	·74	7	F	22	·27			
																	4	F	11	·63	6	Mr	13	·16			
																	2	F	1	·00	3	Mr	2	·53			
																36	6	Jr	21	·37	7	F	19○	·90			
																	5	F	8○	·27	6	Mr	9	·80			
																38	2	Jr	28●○	·63	4	F	27	·16			
																39	7	Jr	18●	·00	1	F	16	·53			
																	5	F	5	·90	7	Mr	6	·43			
																41	3	Jr	25	·26	4	F	23	·80			
																42	7	Jr	14	·63	2	F	13	·16			
																					3	Mr	14	·69			
																	6	F	2	·53	1	Mr	4	·06			
																44	3	Jr	22	·90	5	F	21	·43			
																	2	F	9	·79	4	Mr	11○	·32			
																46	7	Jr	30	·18	1	F	28●	·69			
																47	4	Jr	19○	·53	6	F	18●	·06			
																	3	F	7●	·43	4	Mr	7	·96			
																49	7	Jr	26	·79	2	F	25	·32			
																50	5	Jr	16	·16	6	F	14	·69			
																	4	F	4	·06	5	Mr	5	·59			
																52	1	Jr	24	·42	2	F	22	·96			
																	7	F	11	·32	1	Mr	12	·85			
																	4	Jr	31	·69	6	Mr	2○	·22			
																55	2	Jr	21	·06	3	F	19○	·59			
																	7	F	8●○	·95	2	Mr	9	·48			
																57	5	Jr	28●	·32	6	F	26	·85			
																58	2	Jr	17	·69	4	F	16	·22			
																	1	F	5	·59	3	Mr	7	·12			
																60	5	Jr	25	·95	7	F	24	·84			
																	4	F	12	·85	6	Mr	14	·38			
																	2	F	2	·22	3	Mr	3	·75			

For tithis by Brahma siddhānta add algebraically — ·02 to the above.

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Commencement of solar year. Month and day A.D.	Commencement of solar year. Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaiśākha. Week-day. Month. Day.	Vaiśākha. Fraction.	Jyeṣṭha. Week-day. Month. Day.	Jyeṣṭha. Fraction.	Āshāḍha. Week-day. Month. Day.	Āshāḍha. Fraction.	Śrāvaṇa. Week-day. Month. Day.	Śrāvaṇa. Fraction.	Bhādrapada. Week-day. Month. Day.	Bhādrapada. Fraction.
							A.D.										
3263	219	84	15M	·9016	17·3778	14·754	**162**	5 Ap 2○	·28	6 My 1●	·81	1 My 31	·34	2 Je 29	·87	4 Jl 29	·40
3264	220	85	16M	·1604	6·4861	10·911	**163**	2 Mr 22○	·65	4 Ap 21	·18	5 My 20	·71	7 Je 19 1 Jl 18	·24 ·77	3 Au 17	·30
3265	221	86	15M	·4192	25·1250	9·044	**164**	1 Ap 9	·54	3 My 9	·07	4 Je 7	·60	6 Jl 7	·14	7 Au 5	·67
3266	222	87	15M	·6779	14·2333	5·201	**165**	5 Mr 29	·91	7 Ap 28	·44	1 My 27	·97	3 Je 26	·50	5 Jl 26○	·03
3267	223	88	15M	·9367	3·3416	1·359	**166**	3 Mr 19	·28	4 Ap 17 6 My 17	·81 ·34	7 Je 15	·87	2 Jl 15○	·40	3 Au 13	·93
3268	224	89	16M	·1954	21·9805	27·047	**167**	2 Ap 7	·18	3 My 6	·71	5 Je 5	·24	6 Jl 4●○	·77	1 Au 3	·30
3269	225	90	15M	·4542	11·0888	23·204	**168**	6 Mr 26	·54	1 Ap 25	·07	2 My 24	·60	4 Je 23●	·13	5 Jl 22	·66
3270	226	91	15M	·7129	0·1971	19·361	**169**	3 Mr 15 5 Ap 14	·91 ·44	6 My 13○	·97	1 Je 12	·50	3 Jl 12	·03	4 Au 10	·56
3271	227	92	15M	·9717	18·8359	17·494	**170**	2 Ap 3	·81	4 My 3●○	·34	5 Je 1	·87	7 Jl 1	·40	1 Jl 30	·93
3272	228	93	16M	·2305	7·9442	13·052	**171**	7 Mr 24	·17	1 Ap 22●○	·70	3 My 22	·24	4 Je 20	·77	6 Jl 20 7 Au 18	·30 ·83
3273	229	94	15M	·4892	26·5831	11·785	**172**	6 Ap 11	·07	7 My 10	·60	2 Je 9	·13	3 Jl 8	·66	5 Au 7	·19
3274	230	95	15M	·7480	15·6914	7·942	**173**	3 Mr 31	·44	4 Ap 29	·97	6 My 29	·50	1 Je 28	·03	2 Jl 27	·56
3275	231	96	16M	·0067	4·7997	4·099	**174**	7 Mr 20	·81	2 Ap 19	·34	3 My 18 5 Je 17	·87 ·40	6 Jl 16	·93	1 Au 15○	·46
3276	232	97	16M	·2655	23·4386	2·233	**175**	6 Ap 8	·70	1 My 8	·23	2 Je 6	·76	4 Jl 6	·30	5 Au 4●	·83
3277	233	98	15M	·5242	12·5469	25·945	**176**	4 Mr 28	·07	5 Ap 26	·60	7 My 26	·13	1 Je 24○	·66	3 Jl 24●	·19
3278	234	99	15M	·7830	1·6552	22·102	**177**	1 Mr 17	·44	2 Ap 15 4 My 15	·97 ·50	6 Je 14○	·03	7 Jl 13●	·56	2 Au 12	·09
3279	235	100	16M	·0417	20·2941	20·235	**178**	7 Ap 5	·34	1 My 4	·87	3 Je 3○	·40	4 Jl 2	·93	6 Au 1	·46
3280	236	101	16M	·3005	9·4024	16·392	**179**	4 Mr 25	·70	6 Ap 24	·23	7 My 23●	·76	2 Je 22	·29	3 Jl 21	·82
3281	237	102	15M	·5593	28·0418	14·526	**180**	3 Ap 12○	·60	5 My 12●	·13	6 Je 10	·66	1 Jl 10	·19	2 Au 8	·72
3282	238	103	15M	·8180	17·1496	10·683	**181**	7 Ap 1○	·97	2 My 1	·50	4 My 31	·03	5 Je 29	·56	7 Jl 29	·09
3283	239	104	16M	·0768	6·2579	6·840	**182**	5 Mr 22	·33	6 Ap 20	·86	1 My 20	40	2 Je 18 4 Jl 18	·93 ·46	5 Au 16	·99
3284	240	105	16M	·3355	24·8968	4·973	**183**	4 Ap 10	·23	5 My 9	·76	7 Je 8	·29	1 Jl 7	·82	3 Au 6○	·35
3285	241	106	15M	·5943	14·0051	1·130	**184**	1 Mr 29	·60	3 Ap 28	·13	4 My 27	·66	6 Je 26	·19	7 Jl 25○	·72
3286	242	107	15M	·8530	3·1134	24·842	**185**	5 Mr 18	·97	7 Ap 17 2 My 17	·50 ·03	3 Je 15	·56	5 Jl 15●○	·09	6 Au 13	·62
3287	243	108	16M	·1118	21·7522	22·976	**186**	4 Ap 6	·86	6 My 6	·39	7 Je 4	·92	2 Jl 4●	·46	3 Au 2	·99
3288	244	109	16M	·3706	10·8605	19·133	**187**	2 Mr 27	·23	3 Ap 25	·76	5 My 25○	·29	6 Je 23	·82	1 Jl 23	·35
3289	245	110	15M	·6293	29·4994	17·266	**188**	6 Mr 15 1 Ap 14	·60 ·13	2 My 13●○	·66	4 Je 12	·19	5 Jl 11	·72	7 Au 10	·25
3290	246	111	15M	·8881	18·6077	13·423	**189**	5 Ap 3	·50	7 My 3●○	·03	1 Je 1	·56	3 Jl 1	·09	4 Jl 30	·62
3291	247	112	16M	·1468	7·7160	9·581	**190**	2 Mr 23○	·86	4 Ap 22●	·39	5 My 21	·92	7 Je 20	·45	1 Jl 19 3 Au 18	·98 ·52
3292	248	113	16M	·4056	26·3549	7·714	**191**	1 Ap 11	·76	3 My 11	·29	4 Je 9	·82	6 Jl 9	·35	7 Au 7	·88
3293	249	114	15M	·6643	15·4632	3·871	**192**	6 Mr 31	·13	7 Ap 29	·86	2 My 29	·19	3 Je 27	·72	5 Jl 27	·25
3294	250	115	15M	·9231	4·5715	0·028	**193**	3 Mr 20	·49	5 Ap 19	·02	6 My 18 1 Je 17	·56 ·09	2 Jl 16	·62	4 Au 15	·15
3295	251	116	16M	·1819	23·2104	25·716	**194**	2 Ap 8	·39	3 My 7	·92	5 Je 6	·45	6 Jl 5○	·98	1 Au 4●	·51
3296	252	117	16M	·4406	12·3187	21·873	**195**	6 Mr 28	·76	1 Ap 27	·29	2 My 26	·82	4 Je 25○	·35	5 Jl 24●	·88
3297	253	118	15M	·6994	1·4270	18·031	**196**	4 Mr 17	·13	5 Ap 15 7 My 15	·66 ·19	1 Je 13○	·72	3 Jl 13	·25	4 Au 11	·78
3298	254	119	15M	·9581	20·0659	16·164	**197**	3 Ap 5	·02	7 My 4	·55	6 Je 3	·08	7 Jl 2	.62	2 Au 1	·15
3299	255	120	16M	·2169	9·1742	12·321	**198**	7 Mr 23	·39	1 Ap 23○	·92	3 My 23●	·45	4 Je 21	·91	6 Jl 21	·51
3300	256	121	16M	·4756	27·8131	10·454	**199**	6 Ap 13○	·29	7 My 12	·82	2 Je 11	·35	3 Jl 10	·88	5 Au 9	·41
3301	257	122	15M	·7344	16·9214	6·612	**200**	3 Ap 1●	·66	5 My 1	·19	6 My 30	·72	1 Je 29	·25	2 Jl 28	·78
3302	258	123	15M	·9932	6·0297	2·769	**201**	1 Mr 22●	·02	2 Ap 20	·55	4 My 20	·08	5 Je 18 7 Jl 18	·14 ·61	1 Au 16○	·68
3303	259	124	16M	·2519	24·6686	0·902	**202**	6 Ap 9	·92	1 My 9	·45	2 Je 7	·98	4 Jl 7	·51	6 Au 6○	·04
3304	260	125	16M	·5107	13·7769	24·614	**203**	4 Mr 30	·29	5 Ap 28	·82	7 My 28	·35	1 Je 26	·88	3 Jl 26●○	·41
3305	261	126	15M	·7694	2·8852	20·771	**204**	1 Mr 18	·65	3 Ap 17 4 My 16	·18 ·72	6 Je 15	·25	7 Jl 14●	·78	2 Au 13	·31
3306	262	127	16M	·0282	21·5240	18·904	**205**	7 Ap 6	·55	2 My 6	·08	3 Je 4○	·61	5 Jl 4	·14	6 Au 2	·67
3307	263	128	16M	·2869	10·6323	15·062	**206**	4 Mr 26	·92	6 Ap 25	·45	7 My 24●○	·98	2 Je 23	·51	4 Jl 23	·04
3308	264	129	16M	·5457	29·2712	13·195	**207**	3 Ap 14	·82	5 My 14●○	·35	6 Je 12	·88	1 Jl 12	·41	2 Au 10	·94
3309	265	130	15M	·8044	18·3795	9·352	**208**	1 Ap 3○	·18	2 My 2●	·71	4 Je 1	·24	5 Je 30	·78	7 Jl 30	·31
3310	266	131	16M	·0632	7·4878	5·509	**209**	5 Mr 23○	·55	7 Ap 22	·08	1 My 21	·61	3 Je 20 4 Jl 19	·14 ·67	6 Au 18	·20
3311	267	132	16M	·3220	26·1267	3·543	**210**	4 Ap 11	·45	5 My 10	·98	7 Je 9	·51	2 Jl 9	·04	3 Au 7	·57
3312	268	133	16M	·5807	15·2350	27·355	**211**	1 Mr 31	·82	3 Ap 30	·35	4 My 29	·88	6 Je 28	·41	7 Jl 27	·94
3313	269	134	15M	·8395	4·3433	23·512	**212**	6 Mr 20	·18	7 Ap 18	·71	2 My 18 3 Je 16	·24 ·77	5 Jl 16○	·30	6 Au 14●	·84
3314	270	135	16M	·0982	22·9822	21·645	**213**	5 Ap 8	·08	6 My 7	·61	1 Je 6	·14	2 Jl 5○	·67	4 Au 4●	·20
3315	271	136	16M	·3570	12·0905	17·802	**214**	2 Mr 28	·45	3 Ap 26	·98	5 My 26	·51	7 Je 25○	·04	1 Jl 24	·57
3316	272	137	16M	·6157	1·1988	13·960	**215**	6 Mr 17	·81	1 Ap 16 2 My 15	·34 ·88	4 Je 14●	·41	5 Jl 13	·94	7 Au 12	·47

* Ending moment of tithis are the same for Ārya and Sūrya siddhāntas.

from 1 B.C. to 500 A.D. (Sūrya siddhānta)*—*cont.*

Āśvina.				Kārttika.				Mārgaśirsha.				Pausha.				A.D.	Māgha.			A.D.	Phālguna.			Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
5	Au	27	·93	7	S	26○	·46	1	O	25	·99	3	N	24	·52				5	D	24	·05	63	6	Jr	22	·58	1	F	21	·12
4	S	15●○	·83	6	O	15	·36	7	N	13	·89	2	D	13	·42	64	3	Jr	11	·95					5	F	10	·48	7	Mr	11	·01
2	S	4●	·20	3	O	3	·73	5	N	2	·26	6	D	1	·79		1	D	31	·32	65	2	Jr	29○	·85	4	F	28●	·38
6	Au	24	·56	1	S	23	·09	2	O	22	·62	4	N	21	·15		5	D	20	·69	66	4	Jr	19○	·22	1	F	17●	·75
5	S	12	·46	6	O	11	·99	1	N	10	·52	3	D	10	·05	67	4	Jr	8○	·58		6	F	7	·11	7	Mr	8	·64
2	S	1	·83	4	O	1	·36	5	O	30	·89	7	N	29	·42		1	D	28	·95	68	3	Jr	27	·48	5	F	26	·01
7	Au	21	·20	1	S	19	·73	3	O	19	26	4	N	17○	·79		6	D	17●	·32	69	7	Jr	15	·85	2	F	14	·38
6	S	9	·09	7	O	8	·62	2	N	7○	·15	3	D	6●	·68	70	5	Jr	5	·22		6	F	3	·75	1	Mr	5	·28
3	Au	29	·46	4	S	27	·99	6	O	27○	·52	1	N	26	·05		2	D	25	·58	71	4	Jr	24	·11	5	F	22	·64
2	S	17	·36	3	O	16	·89	5	N	15	·42	6	D	14	·95	72	1	Jr	18	·48		3	F	12	·01	4	Mr	12○	·54
6	S	5○	·72	1	O	5●	·26	2	N	3	·79	4	D	3	·32	73	5	Jr	1	·85		7	Jr	31	·38	1	Mr	1○	·91
4	Au	26○	·09	5	S	24	·62	7	O	24	·15	1	N	22	·68		3	D	22	·21	74	4	Jr	20	·74	6	F	19●○	·28
2	S	13	·99	4	O	13	·52	6	N	12	·05	7	D	11	·58	75	2	Jr	10	·11		3	F	8●	·64	5	Mr	10	·17
7	S	3	·36	1	O	2	·89	5	N	1	·42	4	N	30	·95		6	D	30○	·48	76	1	Jr	29	·01	2	F	27	·54
4	Au	22	·72	6	S	21	·25	7	O	20	·78	2	N	19	·32		3	D	18○	·85	77	5	Jr	17	·38	6	F	15	·91
3	S	10	·62	5	O	10	·15	6	N	8	·68	1	D	8●○	·21	78	2	Jr	6	·74		4	F	5	·27	5	Mr	6	·80
7	Au	30	·99	2	S	29	·52	4	O	29	·05	5	N	27●	·58		7	D	27	·11	79	1	Jr	25	·64	3	F	24	·17
5	Au	20	·36	1	O	18○	·42	2	N	16	·95	4	D	16	·48	80	6	Jr	15	·01		7	F	13	54	2	Mr	14	·07
6	S	18	·89																										
4	S	7	·25	5	O	6○	·78	7	N	5	·31	1	D	4	·84	81	3	Jr	3	·38		4	F	1	·91	6	Mr	3	·44
1	Au	27	·62	3	S	26●○	·15	4	O	25	·68	6	N	24	·21		7	D	23	·74	82	2	Jr	22	·27	3	F	20	·80
7	S	15	·52	2	O	15	·05	3	N	13	·58	5	D	13	·11	83	6	Jr	11	·64		1	F	10○	·17	2	Mr	11●	·70
4	S	4	·88	6	O	4	·42	7	N	2	·95	2	D	2	·48	84	4	Jr	1	·01		5	Jr	30○	·54	7	F	29●	·07
2	Au	24	·25	3	S	22	·78	5	O	22	·31	6	N	20	·84		1	D	20	·37	85	2	Jr	18○	·90	4	F	17	·44
1	S	12	·15	2	O	11	·68	4	N	10	·21	5	D	9	·74	86	7	Jr	8●	·27		1	F	6	·80	3	Mr	8	·33
5	S	1	·52	7	O	1	·05	1	O	30	·58	3	N	29○	·11		4	D	28●	·64	87	6	Jr	27	·17	7	F	25	·70
2	Au	21	·88	4	S	20	·41	5	O	19	·94	7	N	18○	·48		2	D	18●	·01	88	3	Jr	16	·54	5	F	15	·07
1	S	8	·78	3	O	8	·31	4	N	6○	·84	6	D	6	·37	89	7	Jr	4	·90		2	F	3	·43	3	Mr	4	·96
6	Au	29	·15	7	S	27	·68	2	O	27●	·21	3	N	25	·74		5	D	25	·27	90	6	Jr	23	·80	1	F	22	·33
5	S	17	·05	6	O	16	·58	1	N	15	·11	2	D	14	·64	91	4	Jr	13	·17		5	F	11	·70	7	Mr	18○	·23
2	S	6○	·41	3	O	5●	·94	5	N	4	·47	7	D	4	·00	92	1	Jr	2	·54		3	F	1	·07	4	Mr	1●○	·60
6	Au	25○	·78	1	S	24	·31	2	O	23	·84	4	N	22	·37		5	D	21	·90	93	7	Jr	20	·43	1	F	18●	·96
5	S	13	·68	7	O	13	·21	1	N	11	·74	3	D	11	·27	94	4	Jr	9○	·80		6	F	8	·33	7	Mr	9	·86
3	S	3	·04	4	O	2	·58	6	N	1	·11	7	N	30	·64		2	D	30○	·17	95	3	Jr	28	·70	5	F	27	·23
7	Au	23	·41	1	S	21	·94	3	O	21	·47	5	N	20	·00		6	D	19●○	·53	96	1	Jr	18	·06	2	F	16	·60
6	S	10	·31	7	O	9	·84	2	N	8	·37	3	D	7●	·90	97	5	Jr	6	·43		6	F	4	·96	1	Mr	6	·49
3	Au	30	·68	5	S	29	·21	6	O	28○	·74	1	N	27○	·27		2	D	26	·80	98	4	Jr	25	·33	5	F	23	·86
1	Au	20	·04	5	O	18○	·10	5	N	16	·64	7	D	16	·17	99	1	Jr	84	·70		3	F	18	·23	4	Mr	14	·76
2	S	18	·57																										
6	S	7	·94	1	O	7●○	·47	3	N	6	·00	4	D	5	·53	200	6	Jr	4	·06		7	F	2	·59	2	Mr	3	·12
4	Au	27	·31	5	S	25	·84	7	O	25	·37	1	N	23	·90		3	D	23	·43	01	4	Jr	21	·96	6	F	20○	·49
3	S	15	·21	4	O	14	·74	6	N	13	·27	7	D	12	·80	02	2	Jr	11	·33		3	F	9○	·86	5	Mr	11●	·39
7	S	4	·57	2	O	4	·10	3	N	2	·63	5	D	2	·16		6	D	31	·70	03	1	Jr	30○	·23	2	F	28	·76
4	Au	24	·94	6	S	23	·47	1	O	23	·00	2	N	21	·53		4	D	21	·06	04	5	Jr	19	·59	7	F	18	·12
3	S	11	·84	5	O	11	·37	6	N	9	·90	1	D	9○	·43	05	2	Jr	7	·96		4	F	6	·49	6	Mr	8	·02
1	S	1	·20	2	S	30	·74	4	O	30	·27	5	N	28○	·80		7	D	28●	·33	06	1	Jr	26	·86	3	F	25	·39
5	Au	21	·57	7	S	20	·10	1	O	19	·63	3	N	18○	·16		4	D	17	·69	07	6	Jr	16	·22	7	F	14	·76
4	S	9	·47	6	O	9	·00	7	N	7	·53	2	D	7	·06	08	3	Jr	5	·59						2	Mr	16	·29
1	Au	28	·84	3	S	27	·37	4	O	26●	·90	6	N	25	·43		7	D	24	·96		5	F	4	·12	6	Mr	4	·65
7	S	16○	·78	2	O	16●	·26	3	N	14	·80	5	D	14	·33	10	6	Jr	12	·86	09	2	Jr	23	·49	4	F	22	·02
5	S	6○	·10	6	O	5	·63	1	N	4	·16	2	D	3	·69	11	4	Jr	2	·22		1	F	11	·39	2	Mr	12●○	·92
2	Au	26●	·47	4	S	25	·00	5	O	24	·53	7	N	23	·06		1	D	22	·59		5	Jr	31	·75	7	Mr	2●	·28
1	S	13	·37	2	O	12	·90	4	N	11	·43	5	D	10	·96	12	3	Jr	21○	·12		4	F	19					·65
5	S	2	·73	7	O	2	·26	1	O	31	·79	3	N	30	·32	13	7	Jr	9○	·49		2	F	8	·02	3	Mr	9	·55
3	Au	23	·10	4	S	21	·63	6	O	21	·16	7	N	19	·69		4	D	29○	·86	14	6	Jr	28	·39	7	F	26	·92
2	S	11	·00	3	O	10	·53	5	N	9	·06	6	D	8	·59	16	1	Jr	7	·12		2	D	19	·22	15	3	Jr	17	·75	5	F	16	·28
																						2	F	5	·85	4	Mr	6	·18

For tithis by Brahma siddhānta add algebraically — ·02 to the above.

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Commencement of solar year. Month and day A.D.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaiśākha. Week-day.	Month.	Day.	Fraction.	Jyeshṭha. Week-day.	Month.	Day.	Fraction.	Āshādha. Week-day.	Month.	Day.	Fraction.	Śrāvaṇa. Week-day.	Month.	Day.	Fraction.	Bhādrapada. Week-day.	Month.	Day.	Fraction.
							A.D.																				
3317	273	138	15M	·8745	19·8377	12·093	216	5	Ap	4	·71	7	My	4○	·24	1	Je	2●	·77	3	Jl	2	·30	4	Jl	31	·83
3318	274	139	16M	·1333	8·9460	8·250	217	3	Mr	25	·08	4	Ap	23○	·61	6	My	23	·14	7	Je	21	·67	2	Jl	21	·20
3319	275	140	16M	·9920	27·5849	6·383	218	1	Ap	12●	·98	3	My	12	·51	5	Je	11	·04	6	Jl	10	·57	1	Au	9	·10
3320	276	141	16M	·6508	16·6932	2·541	219	6	Ap	2●	·34	7	My	1	·87	2	My	31	·40	3	Je	29	·94	5	Jl	29	·47
3321	277	142	15M	·9095	5·8015	26·252	220	3	Mr	21●	·71	5	Ap	20	·24	6	My	19	·77	1 Je	18	·30	4	Au	16○	·36		
																				2 Jl	17	·83					
3322	278	143	16M	·1683	24·4404	24·386	221	2	Ap	9	·61	4	My	9	·14	5	Je	7	·67	7	Jl	7	·20	1	Au	5●○	·73	
3323	279	144	16M	·4270	13·5486	20·543	222	6	Mr	29	·98	1	Ap	28	·51	3	My	28	·04	4	Je	26	57	6	Jl	26●	·10
3324	280	145	16M	·6858	2·6569	16·700	223	4	Mr	19	·34	5 Ap	17	·87	1	Je	15○	·93	3	Jl	15	·46	5	Au	14	·00	
												7 My	17	·40													
3325	281	146	15M	·9445	21·2958	14·833	224	3	Ap	6	·24	4	My	5	·77	6	Je	4●○	·30	7	Jl	3	·83	2	Au	2	·36
3326	282	147	16M	·2033	10·4041	10·991	225	7	Mr	26	·61	2	Ap	25	·14	3	My	24●○	·67	5	Je	23	·20	6	Jl	22	·73
3327	283	148	16M	·4621	29·0430	9·124	226	6	Ap	14	·50	1	My	14	·04	2	Je	12	·57	4	Jl	12	·10	5	Au	10	·63
3328	284	149	16M	·7208	18·1513	5·281	227	3	Ap	3○	·87	5	My	3	·40	6	Je	1	·93	1	Jl	1	·46	2	Jl	30	·99
3329	285	150	15M	·9796	7·2596	1·438	228	1	Mr	23●○	·24	2	Ap	21	·77	4	My	21	·30	5 Je	19	·83	1	Au	17	·89	
																				7 Jl	19	·36					
3330	286	151	16M	·2383	25·8985	27·126	229	7	Ap	11	·14	1	My	10	·67	3	Je	9	·20	4	Jl	8	·73	6	Au	7	·26
3331	287	152	16M	·4971	15·0068	23·284	230	4	Mr	31	·50	6	Ap	30	·03	7	My	29	·56	2	Je	28	·10	3	Jl	27○	·63
3332	288	153	16M	·7558	4·1151	19·441	231	1	Mr	20	·87	3	Ap	19	·40	4 My	18	·93	7	Jl	16○	·99	2	Au	15●	·52	
																6 Je	17	·46									
3333	289	154	16M	·0146	22·7540	17·574	232	7	Ap	7	·77	2	My	7	·30	3	Je	5	·83	5	Jl	5○	·36	6	Au	3	·89
3334	290	155	16M	·2734	11·8623	13·731	233	5	Mr	28	·14	6	Ap	26	·67	1	My	26	·20	2	Je	24●	·73	4	Jl	24	·26
3335	291	156	16M	·5321	0·9706	9·889	234	2 Mr	17	·50	5	My	15○	·56	7	Je	14●	·09	1	Jl	13	·62	3	Au	12	·16	
								4 Ap	16	·03																	
3336	292	157	16M	·7909	19·7095	8·022	235	1	Ap	5	·40	2	My	4○	·93	4	Je	3●	·46	5	Jl	2	·99	7	Au	1	·52
3337	293	158	16M	·0496	8·7178	4·179	236	5	Mr	24	·77	7	Ap	23●○	·30	1	My	22	·83	3	Je	21	·36	4	Jl	20	·89
																								6	Au	19	·42
3338	294	159	16M	·3084	27·3567	2·312	237	4	Ap	12●	·66	6	My	12	·20	7	Je	10	·73	2	Jl	10	·26	3	Au	8	·79
3339	295	160	16M	·5671	16·4650	26·024	238	2	Ap	2●	·03	3	My	1	·56	5	My	31	·09	6	Je	29	·62	1	Jl	29	·15
3340	296	161	16M	·8259	5·5733	22·181	239	6	Mr	22	·40	7	Ap	20	·93	2	My	20	·46	3 Je	18	·99	7	Au	17●○	·05	
																				5 Jl	18	·52					
3341	297	162	16M	·0547	24·2121	20·315	240	5	Ap	9	·30	6	My	8	·83	1	Je	7	·36	2	Jl	6	·89	4	Au	5●	·42
3342	298	163	16M	·3434	13·3204	16·472	241	2	Mr	29	·66	4	Ap	28	·19	5	My	27	·72	7	Je	26○	·26	1	Jl	25	·79
3343	299	164	16M	·6022	2·4257	12·629	242	7	Mr	19	·03	1 Ap	17	·56	4	Je	15●○	·62	6	Jl	15	·15	7	Au	13	·68	
												3 My	17	·09													
3344	300	165	16M	·8609	21·0676	10·762	243	5	Ap	7	·93	7	My	6	·46	1	Je	4●○	·99	3	Jl	4	·52	5	Au	3	·05
3345	301	166	16M	·1197	10·1759	6·920	244	3	Mr	26	·30	4	Ap	24	·83	6	My	24●	·36	7	Je	22	·89	2	Jl	22	·42
3346	302	167	16M	·3784	28·8148	5·053	245	2	Ap	14○	·19	3	My	13	·72	5	Je	12	·25	6	Jl	11	·78	1	Au	10	·32
3347	303	168	16M	·6372	17·9231	1·210	246	6	Ap	3●○	·56	1	My	3	·09	2	Je	1	·62	4	Jl	1	·15	5	Jl	30	·68
3348	304	169	16M	·8959	7·0314	24·922	247	3	Mr	23●	·93	5	Ap	22	·46	6	My	21	·99	1 Je	20	·52	4	Au	18	·58	
																				3 Jl	20	·05					
3349	305	170	16M	·1547	25·6703	23·055	248	2	Ap	10	·82	4	My	10	·36	5	Je	8	·89	7	Jl	8	·42	1	Au	6	·95
3350	306	171	16M	·4135	14·7786	10·213	249	7	Mr	31	·19	1	Ap	29	·72	3	My	29	·25	4	Je	27	·78	6	Jl	27○	·31
3351	307	172	16M	·6722	3·8869	15·370	250	4	Mr	20	·56	6	Ap	19	·09	7 My	18	·62	3	Jl	16○	·68	5	Au	15	·21	
																2 Je	17	·15									
3352	308	173	16M	·9310	22·5258	13·503	251	3	Ap	8	·46	4	My	7	·99	6	Je	6	·52	1	Jl	6●	·05	2	Au	4	·58
3353	309	174	16M	·1897	11·6341	9·660	252	7	Mr	27	·82	2	Ap	26	·35	3	My	25○	·88	5	Je	24●	·41	6	Jl	23	·95
3354	310	175	16M	·4485	0·7424	5·818	253	5 Mr	17	·19	1	My	15○	·25	2	Je	13●	·78	4	Jl	13	·31	5	Au	11	·84	
								6 Ap	15	·72																	
3355	311	176	16M	·7072	19·3813	3·951	254	4	Ap	5	·09	5	My	4●○	·62	7	Je	3	·15	1	Jl	2	·68	3	Au	1	·21
3356	312	177	16M	·9660	8·4896	0·108	255	1	Mr	25	·45	2	Ap	23●	·99	4	My	23	52	6	Je	22	·05	7	Jl	21	·58
																								2	Au	20	·11
3357	313	178	16M	·2248	27·1285	25·798	256	7	Ap	12●	·35	1	My	11	·88	3	Je	10	·41	4	Jl	9	·94	6	Au	8	·47
3358	314	179	16M	·4835	16·2368	21·953	257	4	Ap	1	·72	6	My	1	·25	7	My	30	·78	2	Je	29	·31	3	Jl	28	·84
3359	315	180	16M	·7423	5·3451	18·110	258	2	Mr	22	·09	3	Ap	20	·62	5	My	20	·15	6 Je	18	·68	2	Au	16●	·74	
																				1 Jl	18	·21					
3360	316	181	17M	·0010	23·9839	16·244	259	7	Ap	9	·98	2	My	9	·51	4	Je	8	·05	5	Jl	7○	·58	7	Au	6●	·11
3361	317	182	16M	·2598	13·0922	12·401	260	5	Mr	29	·35	6	Ap	27	·88	1	My	27	·41	2	Je	25○	·94	4	Jl	25	·47
3362	318	183	16M	·5185	2·2005	8·558	261	2	Mr	18	·72	4 Ap	17	·25	7	Je	15●○	·31	1	Jl	14	·84	3	Au	13	·37	
												5 My	16	·78													
3363	319	184	16M	·7773	20·8394	6·601	262	1	Ap	6	·62	3	My	6	·15	4	Je	4●	·68	6	Jl	4	·21	7	Au	2	·74
3364	320	185	17M	·0361	9·9477	2·849	263	5	Mr	26	·98	7	Ap	25○	·51	2	My	25	04	3	Je	23	·57	5	Jl	23	·11
3365	321	186	16M	·2948	28·5866	0·982	264	4	Ap	13●○	·88	6	My	13	·41	7	Je	11	·94	2	Jl	11	·47	4	Au	10	·00
3366	322	187	16M	·5536	17·6949	24·094	265	2	Ap	3●○	·25	3	My	2	·78	5	Je	1	·31	6	Je	30	·84	1	Jl	30	·37
3367	323	188	16M	·8123	6·8032	20·851	266	6	Mr	23●	·61	1	Ap	22	·15	2	My	21	·68	4 Je	20	·21	7	Au	18	·27	
																				5 Jl	19	·74					
3368	324	189	17M	·0711	25·4421	18·984	267	5	Ap	11	51	7	My	11	·04	1	Je	9	·57	3	Jl	9	·10	4	Au	7○	·63
3369	325	190	16M	·3298	14·5504	15·141	268	2	Mr	30	·88	4	Ap	29	·41	5	My	28	·94	7	Je	27	·47	2	Jl	27○	·00

* Ending moments of tithis by Árya siddhānta are the same as those given above.

from 1 B.C. to A.D. 500 (Sūrya siddhānta)*—*cont.*

Āśvina.			Kārttika.			Mārgaśīrsha.			Pausha.			A.D.	Māgha.			A.D.	Phālguna.			Chaitra.		
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.	
6	Au	30	·36	7	S	28	·90	2	O	28○	·43		3	N	26	·96		5	D	26	·49	
3	Au	19	·73	6	O	17●○	·79	1	N	16	·32		2	D	15	·85	18	4	Jr	14	·38	
5	S	18	·26																			
2	S	7	·63	4	O	7●○	·16	5	N	5	·69		7	D	5	·22	19	1	Jr	3	·75	
7	Au	28○	·00	1	S	26	·53	3	O	26	·06		4	N	24	·59		6	D	24	·12	
5	S	14	·89	7	O	14	·42	1	N	12	·96		3	D	12	·49	21	5	Jr	11	·02	
3	S	4	·26	4	O	3	·79	6	N	2	·32		7	D	1	·85		2	D	31	·38	
7	Au	24	·63	2	S	23	·16	3	O	22	·69		5	N	21	·22		6	D	20○	·75	
6	S	12	·53	1	O	12	·06	2	N	10	·59		4	D	10○	·12	24	5	Jr	8●	·65	
3	Au	31	·89	5	S	30	·42	6	O	29	·95		1	N	28○	·48		3	D	28	·02	
1	Au	21	·26	2	S	19	·79	4	O	19	·32		5	N	17●	·85		7	D	17	·38	
7	S	9	·16	1	O	8	·69	3	N	7●	·22		4	D	6	·75	27	6	Jr	5	·28	
4	Au	29	·52	6	S	28○	.06	7	O	27	·59		2	N	26	·12		3	D	25	·65	
3	S	16○	·42	4	O	15	.95	6	N	14	·48		1	D	14	·01	29	2	Jr	12	·54	
7	S	5	·79	2	O	5	.32	3	N	3	·85		5	D	3	·38	30	6	Jr	1	·91	
5	Au	26●	·16	6	S	24	·69	1	O	24	·22		2	N	22	·75		4	D	22	·28	
4	S	14	·05	5	O	13	·58	7	N	12	·12		1	D	11	·65	32	3	Jr	10●○	·18	
1	S	2	·42	2	O	1	·95	4	O	31	·48		6	N	30	·01		7	D	29●	·54	
5	Au	22	·79	7	S	21	·32	1	O	20	·85		3	N	19	·38		4	D	18	·91	
4	S	10	·69	6	O	10	·22	7	N	8○	·75		2	D	8	·28	35	3	Jr	6	·81	
2	Au	31	·05	3	S	29	·58	5	O	29●○	·11		6	N	27	·64		1	D	27	·18	
7	S	17	·95	2	O	17●○	·48	4	N	16	·01		5	D	15	·54	37	7	Jr	14	·07	
5	S	7○	·32	6	O	6	·85	1	N	5	·38		2	D	4	·91	38	4	Jr	3	·44	
2	Au	27○	·68	4	S	26	·22	5	O	25	·75		7	N	24	·28		1	D	23	·81	
1	S	15	·58	3	O	15	·11	4	N	13	·64		6	D	13	·17	40	7	Jr	11	·70	
5	S	3	·95	7	O	3	·48	2	N	2	·01		3	D	1	·54		5	D	31○	·07	
3	Au	24	·32	4	S	22	·85	6	O	22	·38		7	N	20	·91		2	D	20○	·44	
2	S	12	·21	3	O	11	·74	5	N	10	·28		6	D	9○	·81	43	1	Jr	8	·34	
6	S	1	·58	1	O	1	·11	2	O	30	·64		4	N	29	·17		5	D	28	·70	
3	Au	20	·95	5	S	19	·48	7	O	19	·01		1	N	17	·54		3	D	17	·07	
2	S	8	·85	4	O	8○	·38	5	N	6●	·91		7	D	6	·44	46	1	Jr	4	·97	
7	Au	29	·21	1	S	27○	·74	3	O	27	·27		4	N	25	·80		6	D	25	·34	
6	S	17	·11	7	O	16	·64	2	N	15	·17		3	D	14	·70	48	5	Jr	13	·23	
3	S	5●	·48	5	O	5	·01	6	N	3	·54		1	D	3	·07	49	2	Jr	1	·60	
7	Au	25●	·84	2	S	24	·38	3	O	23	·91		5	N	22	·44		6	D	21	·97	
6	S	13	·74	1	O	13	·27	2	N	11	·80		4	D	11	·33	51	5	Jr	9●	·86	
4	S	3	·11	5	O	2	·64	7	N	1	·17		1	N	30	·70		3	D	30	·23	
1	Au	22	·48	3	S	21	·01	4	O	20	·54		6	N	19○	·07		7	D	18	·60	
7	S	10	·37	1	O	9	·90	3	N	8○	·43		4	D	7	·97	54	6	Jr	6	·50	
4	Au	30	·74	6	S	29	·27	7	O	28●○	·80		2	N	27	·33		3	D	26	·86	
3	S	18○	·64	5	O	18	·17	6	N	16	·70		1	D	16	·23	56	2	Jr	14	·76	
1	S	7○	·01	2	O	6	·54	4	N	5	·07		5	D	4	·60	57	7	Jr	3	·13	
5	Au	27●○	·37	6	S	25	·90	1	O	25	·43		2	N	23	·96		4	D	23	·49	
4	S	15	·27	5	O	14	·80	7	N	13	·33		1	D	12	·86	59	3	Jr	11○	·39	
1	S	4	·64	3	O	4	·17	4	N	2	·70		6	D	2	·23		7	D	31○	·76	
6	Au	24	·00	7	S	22	·53	2	O	22	·07		3	N	20	·60		5	D	20○	·13	
4	S	11	·90	6	O	11	·43	7	N	9	·96		2	D	9	·49	62	4	Jr	8	·02	
2	S	1	·27	3	S	30	·80	5	O	30	·33		6	N	28●	·86		1	D	28	·39	
6	Au	21	·64	1	S	20	·17	**Margasira Kshaya.**					4	N	18●	·23		5	D	17	·76	
				2	O	19○	·70										65	4	Jr	4	·66	
5	S	8	·53	7	O	8○	·06	1	N	6	·59		3	D	6	·13		2	D	25	·02	
2	Au	28	·90	4	S	27○	·43	5	O	26	·96		7	N	25	·49	66	3	Jr	23	·55	
1	S	16●	·80	3	O	16	·33	4	N	14	·86		6	D	14	·39	67	7	Jr	12	.92	
6	S	6●	·17	7	O	5	·70	2	N	4	·23		3	D	3	·76	68	5	Jr	2	·29	
3	Au	25	·53	5	S	24	·06	6	O	23	·59		1	N	22	·12		2	D	21	·65	

17	7	Jr	25	·02	1	F	23	·55				
	5	F	12	·92	7	Mr	14	·45				
	3	F	2	·28	4	Mr	3○	·81				
20	7	Jr	22	·65	2	F	21○	·18				
	6	F	9○	·55	1	Mr	11	·08				
22	3	Jr	29●	·91	5	F	28	·44				
23	1	Jr	19●	·28	2	F	17	·81				
	7	F	7	·18	1	Mr	7	·71				
25	4	Jr	26	·55	6	F	25	·08				
26	1	Jr	15	·91	3	F	14	·44				
					4	Mr	15	·97				
	7	F	3	·81	2	Mr	5	·34				
28	5	Jr	24	·18	6	F	22	·71				
	4	F	11	·08	5	Mr	12●	·61				
	1	Jr	31○	·44	2	Mr	1	·97				
31	5	Jr	20○	·81	7	F	19	·34				
	4	F	8	·71	6	Mr	9	·24				
33	2	Jr	28	·07	3	F	26	·60				
34	6	Jr	17	·44	7	F	15	·97				
	5	F	5	·34	6	Mr	6	·87				
36	2	Jr	25	·71	4	F	24	·24				
	1	F	12	·60	3	Mr	14	·13				
	5	F	1	·97	7	Mr	3○	·50				
39	3	Jr	22	·34	4	F	20○	·87				
	2	F	10○	·24	3	Mr	10	·77				
41	6	Jr	29●	·60	1	F	28	·13				
42	3	Jr	18	·97	5	F	17	·50				
	2	F	6	·87	4	Mr	8	·40				
44	7	Jr	27	·23	1	F	25	·76				
45	4	Jr	15	·60	6	F	14	·13				
					7	Mr	15	·66				
	3	F	3	·50	5	Mr	5	·03				
47	7	Jr	23	·87	2	F	22	·40				
	6	F	11○	·76	1	Mr	12	·29				
	4	Jr	31○	·13	5	Mr	1	·66				
50	1	Jr	20●○	·50	3	F	19	·03				
	7	F	8	·40	1	Mr	9	·93				
52	4	Jr	28	·76	6	F	27	·29				
53	2	Jr	17	·13	3	F	15	·66				
	1	F	5	·03	2	Mr	6	·56				
55	5	Jr	25	·39	6	F	23	·92				
	4	F	13	·29	5	Mr	13○	·82				
	1	F	1	·66	3	Mr	3○	·19				
58	6	Jr	22	·03	7	F	20	·56				
	4	F	9	·92	6	Mr	11	·45				
60	2	Jr	30●	·29	3	F	28	·82				
61	6	Jr	18	·66	1	F	17	·19				
	5	F	6	·55	7	Mr	8	·09				
63	2	Jr	26	·92	4	F	25	·45				
64	7	Jr	16	·29	1	F	14	·82				
					3	Mr	15	·35				
	6	F	3	·19	7	Mr	4	·72				
66	3	Jr	23	·55	5	F	22○	·08				
	2	F	11○	·45	3	Mr	12	·98				
	6	Jr	31●○	·82	1	Mr	1	·35				
69	4	Jr	20	·19	5	F	18	·72				

For tithis by **Brahma siddhānta** add algebraically — ·02 to the above.

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Commencement of solar year. Month and day A.D.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaiśākha. Week-day.	Month.	Day.	Fraction.	Jyeshṭha. Week-day.	Month.	Day.	Fraction.	Āshāḍha. Week-day.	Month.	Day.	Fraction.	Śrāvaṇa. Week-day.	Month.	Day.	Fraction.	Bhādrapada. Week-day.	Month.	Day.	Fraction.
							A.D.																				
3370	326	191	16M	·5886	3·6587	11·299	**269**	7	Mr	20	·25	1	Ap	18	·78	3	My	18	·31	6	Jl	16●	·37	7	Au	14	·90
																4	Je	16	·84								
3371	327	192	16M	·8473	22·2975	9·432	**270**	6	Ap	8	·14	7	My	7	·67	2	Je	6○	·21	3	Jl	5●	·74	5	Au	4	·27
3372	328	193	17M	·1061	11·4059	5·589	**271**	3	Mr	28	·51	5	Ap	27	·04	6	My	26○	·57	1	Je	25●	·10	2	Jl	24	·63
3373	329	194	16M	·3649	0·5142	1·747	**272**	7	Mr	16	·88	3	My	14○	·94	5	Je	13	·47	7	Jl	13	·00	1	Au	11	·53
								2	Ap	15	·41																
3374	330	195	16M	·6236	19·1531	27·434	**273**	6	Ap	4	·78	1	My	4●	·31	2	Je	2	·84	4	Jl	2	·37	5	Jl	31	·90
3375	331	196	16M	·8824	8·2614	23·592	**274**	4	Mr	25○	·14	5	Ap	23●	·67	7	My	23	·20	1	Je	21	·73	3	Jl	21	·27
																								4	Au	19	·80
3376	332	197	17M	·1411	26·9002	21·725	**275**	3	Ap	13	·04	4	My	12	·57	6	Je	11	·10	7	Jl	10	·63	2	Au	9	·16
3377	333	198	16M	·3999	16·0085	17·882	**276**	7	Ap	1	·41	1	Ap	30	·94	3	My	30	·47	5	Je	29	·00	6	Jl	28	·53
3378	334	199	16M	·6586	5·1168	14·039	**277**	4	Mr	21	·77	6	Ap	20	·30	7	My	19	·84	2	Je	18	·33	5	Au	16	·43
																				3	Jl	17	·90				
3379	335	200	16M	·9174	23·7557	12·173	**278**	3	Ap	9	·67	5	My	9	·20	6	Je	7	·73	1	Jl	7○	·26	2	Au	5	·79
3380	336	201	17M	·1762	12·8640	8·330	**279**	1	Mr	30	·04	2	Ap	28	·57	4	My	28	·10	5	Je	26●○	·63	7	Jl	26	·16
3381	337	202	16M	·4349	1·9723	4·487	**280**	5	Mr	18	·41	6	Ap	16	·94	3	Je	15●	·00	4	Jl	14	·53	6	Au	13	·06
												1	My	16	·47												
3382	338	203	16M	·6937	20·6112	3·623	**281**	4	Ap	6	·30	5	My	5○	·83	7	Je	4	·37	1	Jl	3	·90	3	Au	2	·43
3383	339	204	16M	·9524	9·7195	26·332	**282**	1	Mr	26	·67	3	Ap	25●○	·20	4	My	24	·73	6	Je	23	·26	7	Jl	22	·79
3384	340	205	17M	·2112	28·3584	24·465	**283**	7	Ap	14●○	·57	2	My	14	·10	3	Je	12	·63	5	Jl	12	·16	6	Au	10	·69
3385	341	206	16M	·4699	17·4667	20·623	**284**	4	Ap	2●	·94	6	My	2	·47	1	Je	1	·00	2	Je	30	·53	4	Jl	30	·06
3386	342	207	16M	·7287	6·5750	16·780	**285**	2	Mr	23	·80	3	Ap	21	·83	5	My	21	·36	6	Je	19	·89	2	Au	17○	·96
																				1	Jl	19	·42				
3387	343	208	16M	·9875	25·2139	14·913	**286**	1	Ap	11	·20	2	My	10	·73	4	Je	9	·26	5	Jl	8	·79	7	Au	7○	·32
3388	344	209	17M	2462	14·3222	11·070	**287**	5	Mr	31	·57	7	Ap	30	·10	1	My	29	·63	3	Je	28	·16	4	Jl	27●	·69
3389	345	210	16M	·5050	3·4305	7·228	**288**	2	Mr	19	·93	4	Ap	18	·47	7	Je	16○	·53	2	Jl	16●	·06	3	Au	14	·59
												6	My	18	·00												
3390	346	211	16M	·7637	22·0694	5·361	**289**	1	Ap	7	·83	3	My	7	·36	4	Je	5○	·89	6	Jl	5●	·42	7	Au	3	·95
3391	347	212	17M	·0225	11·1777	1·514	**290**	6	Mr	28	·20	7	Ap	26	·73	2	My	26○	·26	3	Je	24	·79	5	Jl	24	·32
3392	348	213	17M	·2812	0·2860	25·230	**291**	3	Mr	17	·57	6	My	15●	·63	1	Je	14	·16	2	Jl	13	·69	4	Au	12	·22
								5	Ap	16	·10																
3393	349	214	16M	·5400	18·9249	23·363	**292**	2	Ap	4○	·46	3	My	3●	·99	5	Je	2	·53	7	Jl	2	·06	1	Jl	31	·59
3394	350	215	16M	·7987	8·0332	19·521	**293**	6	Mr	24○	·83	1	Ap	23	·36	2	My	22	·89	4	Je	21	·42	5	Jl	20	·95
																								7	Au	19	·48
3395	351	216	17M	·0575	26·6720	17·654	**294**	5	Ap	12	·73	7	My	12	·26	1	Je	10	·79	3	Jl	10	·32	4	Au	8	·85
3396	352	217	17M	·3163	15·7803	13·811	**295**	3	Ap	2	·10	4	My	1	·63	6	My	31	·16	7	Je	29	·69	2	Jl	29	·22
3397	353	218	16M	·5750	4·8886	9·968	**296**	7	Mr	21	·46	1	Ap	19	·99	3	My	19	·52	6	Jl	17○	·59	1	Au	16	·12
																5	Je	18	·05								
3398	354	219	16M	·8338	23·5275	8·102	**297**	6	Ap	9	·36	7	My	8	·89	2	Je	7	·42	3	Jl	6●○	·95	5	Au	5	·48
3399	355	220	17M	·0925	12·6358	4·259	**298**	3	Mr	29	·73	5	Ap	28	·26	6	My	27	·79	1	Je	26●	·32	2	Jl	25	·85
3400	356	221	17M	·3513	1·7441	0·416	**299**	1	Mr	19	·09	2	Ap	17	·63	5	Je	15	·69	7	Jl	15	·22	1	Au	13	·75
												4	My	17○	·16												
3401	357	222	16M	·6100	20·3830	26·104	**300**	6	Ap	5	·99	1	My	5●○	·52	3	Je	4	·05	4	Jl	3	·58	6	Au	2	·11
3402	358	223	16M	·8688	9·4913	22·261	**301**	4	Mr	26	·36	5	Ap	24●○	·89	7	My	24	·42	1	Je	22	·95	3	Jl	22	·48
3403	359	224	17M	·1276	28·1302	20·394	**302**	3	Ap	14	·26	4	My	13	·79	6	Je	12	·32	7	Jl	11	·85	2	Au	10	·38
3404	360	225	17M	·3863	17·2385	16·552	**303**	7	Ap	3	·62	2	My	3	·15	3	Je	1	·69	5	Jl	1	·22	6	Jl	30	·75
3405	361	226	16M	·6451	6·3468	12·709	**304**	4	Mr	22	·99	6	Ap	21	·52	1	My	21	·05	2	Je	19	·58	5	Au	17○	·64
																				4	Jl	19	·11				
3406	362	227	16M	·9038	24·9860	10·842	**305**	3	Ap	10	·89	5	My	10	·42	6	Je	8	·95	1	Jl	8	·48	3	Au	7●○	·01
3407	363	228	17M	·1626	14·0940	6·999	**306**	1	Mr	31	·26	2	Ap	29	·79	4	My	29	·32	5	Je	27○	·85	7	Jl	27●	·38
3408	364	229	17M	·4213	3·2023	3·157	**307**	5	Mr	20	·64	7	Ap	19	·15	3	Je	17○	·21	4	Jl	16●	·75	6	Au	15	·28
												1	My	18	·68												
3409	365	230	16M	·6801	21·8412	1·290	**308**	4	Ap	7	·52	6	My	7	·05	7	Je	5○	·58	2	Jl	5	·11	3	Au	3	·64
3410	366	231	16M	·9389	10·9495	25·002	**309**	1	Mr	27	·89	3	Ap	26	·42	4	My	25	·95	6	Je	24	·48	1	Jl	24	·01
3411	367	232	17M	·1976	0·0578	1·159	**310**	6	Mr	17	·25	2	My	15	·32	3	Je	13	·85	5	Jl	13	·38	6	Au	11	·91
								7	Ap	15○	·79																
3412	368	233	17M	·4564	18·6966	19·292	**311**	5	Ap	5○	·15	6	My	4	·68	1	Je	3	·21	2	Jl	2	·74	4	Au	1	·27
3413	369	234	16M	·7151	7·8049	15·450	**312**	2	Mr	24○	·52	4	Ap	23	·05	5	My	22	·58	7	Je	21	·11	1	Jl	20	·64
																								3	Au	19	·17
3414	370	235	16M	·9739	26·4438	13·583	**313**	1	Ap	12	·42	2	My	11	·95	4	Je	10	·48	6	Jl	10	·01	7	Au	8	·54
3415	371	236	17M	·2326	15·5521	9·740	**314**	5	Ap	1	·78	7	My	1	·31	1	My	30	·85	3	Je	29	·38	4	Jl	28○	·91
3416	372	237	17M	·4914	4·6604	5·897	**315**	3	Mr	22	·15	4	Ap	20	·68	6	My	20	·21	2	Jl	18○	·27	3	Au	16	·80
																7	Je	18	·74								
3417	373	238	16M	·7501	23·2993	4·031	**316**	2	Ap	9	·05	3	My	8	·58	5	Je	7	·11	6	Jl	6●	·64	1	Au	5	·17
3418	374	239	17M	·0089	12·4076	0·187	**317**	6	Mr	29	·42	7	Ap	27	·95	2	My	27○	·48	4	Je	26	·01	5	Jl	25	·54
3419	375	240	17M	·2677	1·5159	23·900	**318**	3	Mr	18	·78	5	Ap	17	·31	1	Je	15	·37	2	Jl	14	·91	4	Au	13	·44
												6	My	16○	·84												
3420	376	241	17M	·5264	20·1548	22·033	**319**	2	Ap	6	·68	4	My	6○	·21	5	Je	4	74	7	Jl	4	·27	1	Au	2	·80
3421	377	242	16M	.7852	9·2631	18·190	**320**	7	Mr	26	·05	1	Ap	24●	·58	3	My	24	·11	4	Je	22	·64	6	Jl	22	·17
3422	378	243	17M	·0439	27·9020	16·328	**321**	5	Ap	13	·95	7	My	13	·48	2	Je	12	·01	3	Jl	11	·54	5	Au	10	·07

* Ending moments of tithis by Ārya siddhānta are the same as those given above.

from 1 B.C. to A.D. 500 (Sūrya siddhānta)*—*cont.*

Āśvina.				Kārttika.				Mārgaśīrsha.				Pausha.				A.D.	Māgha.				A.D.	Phālguna.				Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
2	S	13	·43	3	O	12	·96	5	N	11	·49	7	D	11	·02	**70**	7	Jr	9	·55		3	F	8	·08	4	Mr	9	·61
																	5	D	29	·92	**71**	7	Jr	28	·45	1	F	26	·98
6	S	2	·80	1	O	2	·33	2	O	31	·86	4	N	30○	·39		3	D	19	·29	**72**	4	Jr	17	·82	6	F	26	·35
4	Au	23	·16	5	S	21	·69	7	O	21	·22	1	N	19●○	·76														
3	S	10	·06	4	O	9	·59	6	N	8●○	·12	7	D	7	·65	**73**	2	Jr	6	·18		3	F	4	·71	5	Mr	6	·25
																	6	D	26	·55	**74**	1	Jr	25	·08	2	F	23	·61
7	Au	30	·43	1	S	28○	·96	3	O	28	·49	5	N	27	·02														
6	S	18○	·33	7	O	17	·86	2	N	16	·39	3	D	15	·92	**75**	5	Jr	14	·45		6	F	12	·98	1	Mr	14○	·51
																	4	F	2	·35		5	Mr	2●○	·88				
3	S	7●○	·69	5	O	7	·22	6	N	5	·75	1	D	5	·29	**76**	2	Jr	3	·82									
1	Au	27●	·06	2	S	25	·59	4	O	25	·12	5	N	23	·65		7	D	23	·18	**77**	1	Jr	21○	·71	3	F	20●	·24
6	S	14	·96	1	O	14	·49	3	N	13	·02	4	D	12	·55	**78**	6	Jr	11○	·08		7	F	9●	·61	2	Mr	11	·14
																	3	D	31○	·45	**79**	4	Jr	29	·98	6	F	28	·51
4	S	4	·33	5	O	3	·86	7	N	2	·39	1	D	1	·92		7	D	20●	·81	**80**	2	Jr	19	·35	3	F	17	·88
1	Au	24	·69	3	S	23	·22	4	O	22	·75	6	N	21	·28														
7	S	11	·59	2	O	11	·12	3	N	9	·65	5	D	9●	·18	**81**	6	Jr	7	·71		1	F	6	·24	2	Mr	7	·77
																	4	D	28	·08	**82**	5	Jr	26	·61	7	F	25	·14
4	Au	31	·96	6	S	30	·46	1	O	30○	·02	2	N	28	·55											4	F	14	·51
2	Au	21	·32	5	O	19○	·36	**Margasira Kshaya.**				6	N	17	·92		1	D	17	·45	**83**	2	Jr	15	·98	6	Mr	16	·04
3	S	19	·85																										
1	S	9	·22	2	O	8●○	·75	4	N	7	·28	5	D	6	·81	**84**	7	Jr	5	·34		1	F	3	·87	3	Mr	4	·41
5	Au	28	·59	7	S	27●	·12	1	O	26	·65	3	N	25	·18		4	D	24	·71	**85**	6	Jr	23	·24	7	F	21○	·77
4	S	16●	·49	6	O	16	·02	7	N	14	·55	2	D	14	·08	**86**	3	Jr	12	·61		5	F	11●○	·14	6	Mr	12	·67
1	S	5	·85	3	O	5	·38	4	N	3	·91	6	D	3	·45	**87**	7	Jr	1	·98		2	Jr	31●	·51	4	Mr	2	·04
6	Au	26	·22	7	S	24	·75	2	O	24	·28	3	N	22	·81		5	D	22	·34	**88**	6	Jr	20	·87	1	F	19	·40
5	S	13	·12	6	O	12	·65	1	N	11	·18	2	D	10○	·71	**89**	4	Jr	9	·24		5	F	7	·77	7	Mr	9	·30
																	1	D	29	·61	**90**	3	Jr	28	·14	4	F	26	·67
2	S	2	·49	4	O	2	·02	5	O	31	·55	7	N	30●○	·08		5	D	18	·97	**91**	7	Jr	17	·51	2	F	16	·04
6	Au	22	·85	1	S	21	·38	2	O	20	·91	4	N	19●○	·44														
5	S	10	·75	7	O	10○	·28	1	N	8	·81	3	D	8	·34	**92**	4	Jr	6	·87		6	F	5	·40	7	Mr	5	·93
																	2	D	26	·24	**93**	3	Jr	24	·77	5	F	23	·30
3	Au	30	·12	4	S	28○	·65	6	O	28	·18	7	N	26	·71	**94**	1	Jr	14	·14		2	F	12	·67	4	Mr	14●○	·20
2	S	18●○	·01	3	O	17	·55	5	N	16	·08	6	D	15	·61														
6	S	7●	·38	7	O	6	·91	2	N	5	·44	3	D	4	·97	**95**	5	Jr	3	·50		7	F	2○	·03	1	Mr	3●	·57
3	Au	27	·75	5	S	26	·28	6	O	25	·81	1	N	24	·34		2	D	23	·87	**96**	4	Jr	22○	·40	5	F	20	·93
2	S	14	·65	4	O	14	·18	5	N	12	·71	7	D	12	·24	**97**	1	Jr	10○	·77		3	F	9	·30	4	Mr	10	·83
																	6	D	31●	·14	**98**	7	Jr	29	·67	2	F	28	·20
7	S	4	·01	1	O	3	·54	3	N	2	·07	4	D	1	·61		3	D	20●	·50	**99**	5	Jr	19	·03	6	F	17	·56
4	Au	24	·38	5	S	22	·91	7	O	22	·44	1	N	20	·97	**300**	3	Jr	8	·40		4	F	6	·93	6	Mr	7	·46
3	S	12	·28	4	O	11	·81	6	N	10○	·34	7	D	9●	·87														
																	6	D	27	·77	**01**	1	Jr	26	·30	2	F	24	·83
7	Au	31	·65	2	S	30	·18	3	O	29○	·71	5	N	28	·24	**02**	5	Jr	15	·67		7	F	14	·20	1	Mr	15	·73
5	Au	21	·01	1	O	19○	·07	2	N	17	·60	4	D	17	·13														
6	S	19	·54													**03**	3	Jr	5	·03		4	F	3	·56	6	Mr	5○	·09
3	S	8	·91	5	O	8●	·44	6	N	6	·97	1	D	6	·50		7	D	25	·14	**04**	1	Jr	23	·93	3	F	22●○	·46
1	Au	29○	·28	2	S	27	·81	4	O	27	·34	5	N	25	·87														
7	S	16	·17	1	O	15	·71	3	N	14	·24	4	D	13	·77	**05**	6	Jr	12	·30		7	F	10	·83	2	Mr	12	·36
																	5	Jr	31	·19		6	Mr	1	·73				
4	S	5	·54	6	O	5	·07	7	N	3	·60	2	D	3	·13	**06**	3	Jr	1	·66									
1	Au	25	·91	3	S	24	·44	4	O	23	·97	6	N	22	·50		1	D	22○	·03	**07**	2	Jr	20	·56	4	F	19	·09
7	S	13	·81	2	O	13	·34	3	N	11	·87	5	D	11○	·40	**08**	6	Jr	9	·93		1	F	8	·46	2	Mr	8	·99
																	4	D	29	·30	**09**	5	Jr	27	·83	7	F	26	·36
5	S	2	·17	6	O	1	·70	1	O	31	·23	2	N	29●○	·77		1	D	18	·66	**10**	3	Jr	17	·19	4	F	15	·72
2	Au	22	·54	4	S	21	·07	5	O	20	·60	7	N	19	·13														
1	S	10	·44	2	O	9○	·97	4	N	8	·50	6	D	8	·03	**11**	7	Jr	6	·56		2	F	5	·09	3	Mr	6	·62
																	4	D	26	·93	**12**	6	Jr	25	·46	7	F	23	·99
5	Au	30	·81	7	S	29○7	·34	1	O	28	·87	3	N	27	·40														
4	S	17	·70	6	O	17	·23	7	N	15	·76	2	D	15	·29	**13**	3	Jr	13	·83		5	F	12○	·36	6	Mr	13	·89
																	2	F	1○	·72		4	Mr	3●	·25				
2	S	7●	·07	3	O	6	·60	5	N	5	·13	6	D	4	·66	**14**	1	Jr	3	·19									
6	Au	27	·44	7	S	25	·97	2	O	25	·50	4	N	24	·03		5	D	23	·56	**15**	7	Jr	22○	·09	1	F	20	·62
5	S	15	·33	6	O	14	·87	1	N	13	·40	2	D	12	·93	**16**	4	Jr	11	·46		5	F	9	·99	7	Mr	10	·52
																	1	D	30●	·82	**17**	3	Jr	29	·85	4	F	27	·89
2	S	3	·70	4	O	3	·23	5	N	1	·76	7	D	1	·29		6	D	20	·19	**18**	7	Jr	18	·72	2	F	17	·25
7	Au	24	·07	1	S	22	·60	3	O	22	·13	4	N	20○	·66														
	S	11	·97	7	O	11	·50	2	N	10○	·08	3	D	9	·56	**19**	5	Jr	8	·09		6	F	6	·62	1	Mr	8	·15
																	2	D	28	·46	**20**	3	Jr	26	·99	5	F	25	·52
3	S	1	·33	4	S	30	·86	6	O	30○	·39	7	N	28	·93														
7	Au	20	·70	3	O	18●	·76	5	N	17	·29	6	D	16	·82	**21**	1	Jr	15	·35		2	F	13	·88	4	Mr	15○	·41
2	S	19	·23													**22**	5	Jr	4	·72		7	F	3	·25	1	Mr	4○	·78
6	S	8○	·60	1	O	8	·13	2	N	6	·66	4	D	6	·19														

For tithis by Brahma siddhānta add algebraically —·02 to the above.

TABLE II.—NEW MOONS AND ECLIPSES

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Commencement of solar year. Month and day A.D.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaiśākha. Week-day.	Month.	Day.	Fraction.	Jyeṣṭha. Week-day.	Month.	Day.	Fraction.	Āshādha. Week-day.	Month.	Day.	Fraction.	Śrāvaṇa. Week-day.	Month.	Day.	Fraction.	Bhādrapada. Week-day.	Month.	Day.	Fraction.
							A.D.																				
3423	379	244	17M	·3027	17·0103	12·481	322	3	Ap	3	·31	4	My	2	·84	6	Je	1	·37	7	Je	30	·90	2	Jl	30	.43
3424	380	245	17M	·5614	6·1186	8·638	323	7	Mr	23	·68	2	Ap	22	·21	3	My	21	·74	5	Je	20	·27	1	Au	18○	·33
3425	381	246	16M	·8292	24·7575	6·771	324	6	Ap	10	·58	1	My	10	·11	2	Je	8	·64	6	Jl	19	·80				
3426	382	247	17M	·0790	13·8658	2·928	325	3	Mr	31	·94	5	Ap	29	·47	7	My	29	·01	4	Jl	8○	·17	5	Au	6	·70
3427	383	248	17M	·3377	2·9741	26·640	326	1	Mr	20	·34	2	Ap	18	·84					1	Je	27○	·54	3	Jl	27	·07
3428	384	249	17M	·5965	21·6130	24·773	327	7	Ap	8	·21	4	My	18	·37	5	Je	16○	·90	7	Jl	16	·43	1	Au	14	·96
3429	385	250	16M	·8552	10·7213	20·931	328	4	Mr	27	·58	6	Ap	26○	·11	7	My	25	·64	2	Je	24	·17	3	Jl	23	·70
3430	386	251	17M	·1140	29·3601	19·064	329	1	Mr	16	·94																
3431	387	252	17M	·3727	18·4684	15·221	330	7	Ap	4○	·84	2	My	4	·37	3	Je	2	·90	5	Jl	2	·43	6	Jl	31	·96
3432	388	253	17M	·6315	7·5767	11·379	331	5	Mr	25●	·21	6	Ap	23	·74	1	My	23	·27	2	Je	21	·80	4	Jl	21	·33
3433	389	254	16M	·8902	26·2156	9·512	332	4	Ap	12	·11	5	My	11	·64	7	Je	10	·17	1	Jl	9	·70	5	Au	19	·86
3434	390	255	17M	·1490	15·3239	5·689	333	1	Ap	1	·47	3	My	1	·00	4	My	30	·53	6	Je	29	·06	3	Au	8○	·23
3435	391	256	17M	·4078	4·4322	1·826	334	5	Mr	21	·84	7	Ap	20	·37	1	My	19	·90					7	Jl	28●○	·59
3436	392	257	17M	·6665	23·0711	27·514	335	4	Ap	9	·74	6	My	9	·27	3	Je	18	·43	4	Jl	17●	·96	6	Au	16	·49
3437	393	258	16M	·9253	12·1794	23·671	336	2	Mr	29	·10	3	Ap	27	·63	7	Je	7○	·80	2	Jl	7	·33	3	Au	5	·86
3438	394	259	17M	·1840	1·2877	19·829	337	6	Mr	18	·47	1	Ap	17	·00	5	My	27○	·17	6	Je	25	·70	1	Jl	25	·23
3439	395	260	17M	·4428	19·9266	17·962	338	5	Ap	6	·37	2	My	16○	·53	4	Je	15	·06	5	Jl	14	·59	7	Au	13	·12
3440	396	261	17M	·7015	9·0349	14·119	339	2	Mr	26○	·74	6	My	5●	·90	1	Je	4	·43	2	Jl	3	·96	4	Au	2	·49
3441	397	262	16M	·9603	27·6738	13·252	340	1	Ap	13	·63	4	Ap	25	·27	5	My	24	·80	7	Je	23	·33	1	Jl	22	·86
3442	398	263	17M	·2191	16·7821	8·410	341	6	Ap	3	·00	3	My	13	·16	4	Je	11	·69	6	Jl	11	·23	7	Au	9	·76
3443	399	264	17M	·4778	5·8904	4·567	342	3	Mr	23	·37	7	My	2	·53	2	Je	1	·06	3	Je	30	·59	5	Jl	30	·12
3444	400	265	17M	·7366	24·5293	2·700	343	2	Ap	11	·27	4	Ap	21	·90	6	My	21	·43	7	Je	19	·95				
3445	401	266	16M	·9953	13·6376	26·412	344	6	Mr	30	·63	3	My	10	·80	5	Je	9	·33	2	Jl	19○	·49	4	Au	18	·02
3446	402	267	17M	·2541	2·7459	22·589	345	4	Mr	20	·00	1	My	29	·16	2	My	28	·69	4	Je	27○	·22	5	Jl	26	·75
3447	403	268	17M	·5128	21·3848	20·702	346	2	Ap	7	·90	5	Ap	18	·53												
3448	404	269	17M	·7716	10·4981	16·860	347	7	Mr	28	·26	7	My	18	·06	1	Je	16	·59	3	Jl	16	·12	4	Au	14	·65
3449	405	270	17M	·0304	29·1319	14·993	348	6	Ap	15●○	·16	4	My	7○	·43	5	Je	5●	·96	7	Jl	5	·49	2	Au	4	·02
3450	406	271	17M	·2891	18·2402	11·150	349	3	Ap	4●	·53	7	My	7	·06	3	My	26	·33	6	Je	2	·59	1	Jl	2	·12	6	Jl	24	·39
3451	407	272	17M	·5479	7·3485	7·307	350	7	Mr	24	·90	2	Ap	23	·43	3	My	22	·96	5	Je	21	·49	7	Jl	21	·02
3452	408	273	17M	·8066	25·3874	5·441	351	6	Ap	12	·79	1	My	12	·32	2	Je	10	·85	4	Jl	10	·39	1	Au	19○	·55
3453	409	274	17M	0654	15·0957	1·598	352	4	Ap	1	·16	5	Ap	30	·69	7	My	30	·22	1	Je	28	·75	5	Au	8○	·92
3454	410	275	17M	·3241	4·2040	25·310	353	1	Mr	21	·53	3	Ap	20	·06	4	My	19	·59					3	Jl	28○	·28
3455	411	276	17M	·5829	22·8429	23·443	354	7	Ap	9	·43	1	My	8	·96	6	Je	18○	·12	7	Jl	17●	·65	2	Au	16	·18
3456	412	277	17M	·8416	11·9512	19·600	355	4	Mr	29	·79	6	Ap	28	·32	3	Je	7○	·49	5	Jl	7	·02	6	Au	5	·55
3457	413	278	17M	·1004	1·0595	15·758	356	2	Mr	18	·16	3	Ap	16	·69	7	My	27●○	·85	2	Je	26	·38	3	Jl	25	·91
3458	414	279	17M	·3592	19·6984	13·891	357	1	Ap	6○	·06	5	My	16	·22	6	Je	14	·75	1	Jl	14	·28	2	Au	12	·81
3459	415	280	17M	·6179	8·8067	10·048	358	5	Mr	26●○	·42	6	Ap	24	·95	1	My	24	·49	3	Je	23	·02	4	Jl	22	·55
3460	416	281	17M	·8767	27·4459	8·181	359	4	Ap	14	·32	5	My	13	·85	7	Je	12	·38	1	Jl	11	·91	3	Au	10	·44
3461	417	282	17M	·1354	16·5539	4·339	360	1	Ap	2	·69	3	My	2	·22	4	My	31	·75	6	Je	30	·28	7	Jl	29	·81
3462	418	283	17M	·3942	5·6622	0·498	361	6	Mr	23	·30	7	Ap	21	·59	2	My	21	·12								
3463	419	284	17M	6529	24·3011	26·184	362	4	Ap	10	·95	6	My	10	·48	3	Je	19	·65	5	Jl	19○	·18	6	Au	17●	·71
3464	420	285	17M	·9117	13·4094	22·341	363	2	Mr	31	·32	3	Ap	29	·85	5	My	29	·38	6	Je	27	·91	1	Jl	27	·44
3465	421	286	17M	·1705	2·5177	18·498	364	6	Mr	19	·69	1	Ap	18	·22	4	Je	16●	·28	5	Jl	15	·81	7	Au	14	·34
3466	422	287	17M	·4292	21·1565	16·631	365	5	Ap	7	·59	2	My	17○	·75												
3467	423	288	17M	·6880	10·2648	12·789	366	2	Mr	27	·95	7	My	7○	·12	1	Je	5●	·65	3	Jl	5	·18	4	Au	3	·71
3468	424	289	17M	·9467	28·9037	10·922	367	1	Ap	15	·85	4	Ap	26○	·48	6	My	26	·01	7	Je	24	·54	2	Jl	24	·07
3469	425	290	17M	·2055	18·0120	7·079	368	6	Ap	4●	·22	3	My	15	·38	4	Je	13	·91	6	Jl	13	·44	7	Au	11	·97
3470	426	291	17M	·4642	7·1203	3·236	369	3	Mr	24	·58	7	My	3	·75	2	Je	2	·28	3	Jl	1	·81	5	Jl	31	·34
3471	427	292	17M	·7230	25·7592	1·370	370	2	Ap	12	·48	5	Ap	23	·11	6	My	22	·65	1	Je	21	·18				
3472	428	293	17M	·9818	14·8675	25·082	371	6	Ap	1	·85	4	My	12	·01	5	Je	10	·54	2	Jl	20	·71	4	Au	19○	·24
3473	429	294	17M	·2405	3·9758	21·239	372	4	Mr	21	·22	1	My	1	·38	2	My	30	·91	7	Jl	10	·07	1	Au	8●○	·60
3474	430	295	17M	·4983	22·6147	19·372	373	3	Ap	9	·11	5	Ap	19	·75	7	My	19	·28	4	Je	29○	·44	5	Jl	28	·97
3475	431	296	17M	·7580	11·7230	15·529	374	7	Mr	29	·48	4	My	8	·64	1	Je	17○	·81	3	Jl	17●	·34	4	Au	15	·87
												2	Ap	28	·01	6	Je	7●○	·17	7	Jl	6	·71	2	Au	5	·24
												3	My	27	·54	5	Je	26	·07	6	Jl	25	·60				

• Ending moments of tithis by Ārya siddhānta are the same as the above.

from 1 B.C. to A.D. 500 (Sūrya siddhānta)*—*cont.*

Āśvinā.				Kārttika.				Mārgaśirsha.				Pausha.			A.D.	Māgha.			A.D.	Phālguna.				Chaitra.		
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
3	Au	28○	·97	5	S	27	·50	7	O	27	·03	1	N	25	·56		3	D	25	·09	**23**	4	Jr	23	·62	6	F	22	·15
2	S	16	·86	4	O	16	·39	5	N	14	·92	7	D	14	·45	**24**	1	Jr	12	·99		3	F	11●	·52	5	Mr	12	·05
7	S	5	·23	1	O	4	·76	3	N	3	·29	4	D	2	·82	**25**	6	Jr	1○	·35		7	Jr	30	·88	2	Mr	1	·41
4	Au	25	·60	6	S	24	·13	7	O	23	·66	2	N	22	·19		3	D	21●○	·72	**26**	5	Jr	20	·25	6	F	18	·78
3	S	13	·49	5	O	13	·03	6	N	11	·56	1	D	11●○	·09	**27**	2	Jr	9	·62		4	F	8	·15	5	Mr	9	·68
7	S	2	·80	2	O	2	·39	3	O	31	·92	5	N	30	·45		6	D	29	·98	**28**	1	Jr	28	·51	3	F	27	·05
5	Au	22	·23	6	S	20	·76	1	O	20○	·29	2	N	18	·82	**29**	4	D	18	·35		5	Jr	16	·88	7	F	15	·41
4	S	10	·13	5	O	9●○	·66	7	N	8	·19	1	D	7	·72	**30**	3	Jr	6	·25		4	F	4	·78	6	Mr	6	·31
1	Au	30	·49	3	S	29	·02	4	O	28	·55	6	N	27	·09		7	D	26	·62	**31**	2	Jr	25	·15	3	F	23○	·68
7	S	18	·39	1	O	17	·92	3	N	16	·45	4	D	15	·98	**32**	6	Jr	14	·51		1	F	13○	·04	2	Mr	13●	·57
4	S	6	·76	6	O	6	·29	7	N	4	·82	2	D	4	·35	**33**	3	Jr	2	·88		5	F	1●○	·41	6	Mr	2	·94
2	Au	27	·13	3	S	25	·66	5	O	25	·19	6	N	23	·72		1	D	23	·25	**34**	2	Jr	21●	·78	4	F	20	·31
1	S	15	·02	2	O	14	·55	4	N	13	·08	5	D	12	·61	**35**	7	Jr	11	·15		1	F	9	·68	3	Mr	11	·21
5	S	4	·39	6	O	3	·92	1	N	2	·45	2	D	1○	·98		4	D	31	·51	**36**	6	Jr	30	·04	7	F	28	·57
2	Au	23	·76	4	S	22	·29	5	O	21	·82	7	N	20○	·35		1	D	19	·88	**37**	3	Jr	18	·41	4	F	16	·94
1	S	11	·65	3	O	11	·19	4	N	9○	·72	6	D	9	·25	**38**	7	Jr	7	·78		2	F	6	·31	3	Mr	7	·84
6	S	1	·02	7	S	30	·55	2	O	30	·08	3	N	28	·61		5	D	28	·14	**39**	6	Jr	26	·67	1	F	25	·21
{ 3	Au	21	·39	6	O	19●	·45	7	N	17	·98	2	D	17	·51	**40**	4	Jr	16	·04		5	F	14	·57	7	Mr	15○	·10
{ 4	S	19○	·92																									
2	S	8○	·29	3	O	7	·82	5	N	6	·35	6	D	5	·88	**41**	1	Jr	4	·41		2	F	2	·94	4	Mr	4●	·47
6	Au	28○	·65	1	S	27	·18	2	O	26	·71	4	N	25	·25		5	D	24	·78	**42**	7	Jr	23	·31	1	F	21	·84
5	S	16	·55	7	O	16	·08	1	N	14	·61	3	D	14	·14	**43**	4	Jr	12○	·67		6	F	11	·20	7	Mr	12	·73
2	S	5	·92	4	O	5	·45	5	N	3	·98	7	D	3	·51	**44**	2	Jr	2○	·04		3	Jr	31	·57	4	Mr	1	·10
7	Au	25	·29	1	S	23	·82	3	O	23	·35	4	N	21	·88		6	D	21○	·41	**45**	7	Jr	19	·94	2	F	18	·47
6	S	13	·18	7	O	12	·71	2	N	11	·24	3	D	10	·77	**46**	5	Jr	9	·31		6	F	7	·84	1	Mr	9	·37
3	S	2	·55	5	O	2	·08	6	O	31○	·61	1	N	30	·14		2	D	29	·67	**47**	4	Jr	28	·20	5	F	26	·73
7	Au	22	·92	2	S	21	.45	3	O	20○	·98	5	N	19	·51		7	D	19	·04	**48**	1	Jr	17	·57	{ 3	F	16	·10
6	S	9	·81	1	O	9●	·35	2	N	7	·88	4	D	7	·41	**49**	5	Jr	5	·94		7	F	4	·47	{ 4	Mr	16	·63
4	Au	30	·18	5	S	28	·71	7	O	28	·24	1	N	26	·77		3	D	26	·30	**50**	4	Jr	24	·83	2	Mr	6	·00
3	S	18	·08	4	O	17	·61	6	N	16	·14	7	D	15	·67	**51**	2	Jr	14	·20		3	F	12○	·73	6	F	23○	·37
7	S	7	·45	1	O	6	·98	3	N	5	·51	5	D	5	·04	**52**	6	Jr	3	·57		1	F	2●	·10	5	Mr	14	·26
4	Au	26	·81	6	S	25	·34	7	O	24	·87	2	N	23	·41		3	D	22	·94	**53**	5	Jr	21	·47	2	Mr	2	·63
3	S	14	·71	5	O	14	·24	6	N	12	·77	1	D	12○	·30	**54**	2	Jr	10●	·83		4	F	9	·36	7	F	20	·00
1	S	4	·08	2	O	3	·61	4	N	2	·14	5	D	1○	·67		7	D	31	·20	**55**	1	Jr	29	·73	5	Mr	10	·89
5	Au	24	·45	6	S	22	·98	1	O	22	·51	3	N	21○	·04		4	D	20	·57	**56**	3	F	28	·26				
4	S	11	·34	5	O	10	·87	7	N	9●	·40	1	D	8	·93	**57**	3	Jr	7	·47		6	Jr	19	·10	7	F	17	·63
1	Au	31	·71	3	S	30○	·24	4	O	29	·77	6	N	28	·30		7	D	27	·83	**58**	5	F	6	·00	6	Mr	7	·53
{ 6	Au	21	·08	2	O	19	·14	3	N	17	·67	5	D	17	·20	**59**	6	Jr	15	·73		2	Jr	26	36	3	F	24	·89
{ 7	S	19○	·61																									
4	S	8●○	·97	6	O	8	·51	1	N	7	·04	2	D	6	·57	**60**	4	Jr	5	·10		1	F	14	·26	2	Mr	15○	·79
2	Au	28●	·34	3	S	26	·87	5	O	26	·40	6	N	24	·93		1	D	24	·46	**61**	5	F	3	·63	7	Mr	4●	·16
1	S	16	·24	2	O	15	·77	4	N	14	·30	5	D	13	·83	**62**	7	Jr	12○	·36		2	Jr	22○	·99	4	F	21	·53
5	S	5	·61	7	O	5	·14	1	N	3	·67	3	D	3	·20	**63**	4	Jr	1●○	·73		1	F	10	·89	3	Mr	12	·42
2	Au	25	·97	4	S	24	·50	6	O	24	·03	7	N	22	·57		2	D	22	·10	**64**	6	Jr	31	·26	7	Mr	1	·76
1	S	12	·87	3	O	12	·40	4	N	10○	·93	6	D	10	·46	**65**	7	Jr	8	·99		3	Jr	20	·63	5	F	19	·19
6	S	2	·24	7	O	1	·77	2	O	31○	·30	3	N	29	·83		5	D	29	·36	**66**	2	F	7	·52	4	Mr	9	·08
3	Au	22	·61	5	S	21	·14	6	O	20○	·67	1	N	19	·20		2	D	18	·73	**67**	6	Jr	27	·89	1	F	26	·42
2	S	10	·50	4	O	10●	·03	5	N	8	·56	7	D	8	·09	**68**	1	Jr	6	·63		{ 4	Jr	17	·26				
6	Au	29○	·87	1	S	28	·40	2	O	27	·93	4	N	26	·46		5	D	25	·99	**69**	{ 5	F	15	·79	7	Mr	17	·32
5	S	17	·77	7	O	17	·30	1	N	15	·83	3	D	15	·36	**70**	4	Jr	13	·89		3	F	5	·16	4	Mr	5○	·69
3	S	7	·13	4	O	6	·67	6	N	5	·20	7	D	4	·73	**71**	2	Jr	3	·26		7	Jr	24	·52	2	F	23○	·05
7	Au	27	·50	2	S	26	·03	3	O	25	·56	5	N	24	·09		6	D	23○	·62	**72**	6	F	12	·42	7	Mr	13	·95
6	S	14	·40	7	O	13	·93	2	N	12	·46	3	D	11○	·99	**73**	5	Jr	10	·52		3	F	1●	·79	5	Mr	3	·32
3	S	3	·77	5	O	3	·30	6	N	1	·83	1	D	1○	·36		2	D	30	·89	**74**	1	Jr	22	·15	2	F	20	·69
1	Au	24	·13	2	S	22	·66	4	O	22	·19	5	N	20●	·73		7	D	20	·26	**75**	4	Jr	29	·42	5	F	27	·95
																						1	Jr	18	·79	3	F	17	·32

For tithis by Brahma siddhānta add algebraically —·02 to the above.

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Commencement of solar year. Month and day A.D.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaiśākha. Week-day.	Month.	Day.	Fraction.	Jyeshṭha. Week-day.	Month.	Day.	Fraction.	Āshāḍha. Week-day.	Month.	Day.	Fraction.	Śrāvaṇa. Week-day.	Month.	Day.	Fraction.	Bhādrapada. Week-day.	Month.	Day.	Fraction.
							A.D.																				
3476	432	297	18M	·0168	0·8313	11·687	**375**	4	Mr	18	·85	7	My	16	·91	2	Je	15	·44	3	Jl	14	·97	5	Au	13	·50
								6	Ap	17○	·38																
3477	433	298	17M	·2755	19·4702	9·820	**376**	3	Ap	5○	·75	5	My	5	·28	6	Je	3	·81	1	Jl	3	·34	2	Au	1	·87
3478	434	299	17M	·5343	8·5785	5·977	**377**	1	Mr	26○	·11	2	Ap	24	·64	4	My	24	·17	5	Je	22	·70	7	Jl	22	·23
																								1	Au	20	·77
3479	435	300	17M	·7930	27·2174	4·110	**378**	7	Ap	14	·01	1	My	13	·54	3	Je	12	·07	4	Jl	11	·60	6	Au	10	·13
3480	436	301	18M	·0518	16·3259	0·268	**379**	4	Ap	3	·38	5	My	2	·91	7	Je	1	·44	1	Je	30	·97	3	Jl	30○	·50
3481	437	302	17M	·3106	5·4340	23·979	**380**	1	Mr	22	·74	3	Ap	21	·27	4	My	20	·81	7	Jl	18○	·87	2	Au	17	·40
																6	Je	19	·34								
3482	438	303	17M	·5693	24·0729	22·113	**381**	7	Ap	10	·64	2	My	10	·17	3	Je	8	·70	5	Jl	8●	·23	6	Au	6	·76
3483	439	304	17M	·8281	13·1812	18·270	**382**	5	Mr	31	·01	6	Ap	29	·54	1	My	29○	·07	2	Je	27	·60	4	Jl	27	·13
3484	440	305	18M	·0868	2·2895	14·427	**383**	2	Mr	20	·38	3	Ap	18	·91	6	Je	16	·97	1	Jl	16	·50	3	Au	15	·03
												5	My	18○	·44												
3485	441	306	17M	·3456	20·9283	12·560	**384**	1	Ap	7	·27	2	My	6○	·80	4	Je	5	·33	5	Jl	4	·87	7	Au	3	·40
3486	442	307	17M	·6043	10·0366	8·718	**385**	5	Mr	27	·64	7	Ap	26●	·17	1	My	25	·70	3	Je	24	·23	4	Jl	23	·76
3487	443	308	17M	·8631	28·6755	6·851	**386**	4	Ap	15●	·54	6	My	15	·07	7	Je	13	·60	2	Jl	13	·13	3	Au	11	·66
3488	444	309	18M	·1219	17·7838	3·008	**387**	1	Ap	4	·91	3	My	4	·44	4	Je	2	·97	6	Jl	2	·50	1	Au	1	·03
3489	445	310	17M	·3806	6·8921	26·720	**388**	6	Mr	24	·27	7	Ap	22	·80	2	My	22	·33	3	Je	20	·86	6	Au	18●○	·93
																				5	Jl	20	·39				
3490	446	311	17M	·6394	25·5310	24·853	**389**	5	Ap	12	·17	6	My	11	·70	1	Je	10	·23	2	Jl	9	·76	4	Au	8	·29
3491	447	312	17M	·8981	14·6393	21·011	**390**	2	Ap	1	·54	4	My	1	·07	5	My	30	·60	7	Je	29○	·13	1	Jl	28	·66
3492	448	313	18M	·1569	3·7476	17·168	**391**	6	Mr	21	·90	1	Ap	20	·43	2	My	19	·97	6	Jl	18	·03	7	Au	16	·56
																4	Je	18○	·50								
3493	449	314	17M	·4156	22·3865	15·301	**392**	5	Ap	8	·80	7	My	8	·33	1	Je	6●	·86	3	Jl	6	·39	4	Au	4	·92
3494	450	315	17M	·6744	11·4948	11·458	**393**	3	Mr	29	·17	4	Ap	27○	·70	6	My	27●	.23	7	Je	35	·76	2	Jl	25	·29
3495	451	316	17M	.9332	0·6031	7·616	**394**	7	Mr	18	·54	3	My	16	·60	5	Je	15	·13	6	Jl	14	·66	1	Au	13	·19
								2	Ap	17●○	·07																
3496	452	317	18M	·1919	19·2420	5·749	**395**	6	Ap	6●○	·43	7	My	5	·96	2	Je	4	·49	4	Jl	4	·03	5	Au	2	·56
3497	453	318	17M	·4507	8·3503	1·906	**396**	3	Mr	25	·80	5	Ap	24	·33	6	My	23	·86	1	Je	22	·39	2	Jl	21	·92
																								4	Au	20	·45
3498	454	319	17M	·7094	26·9892	0·039	**397**	2	Ap	13	·70	4	My	13	·23	5	Je	11	·76	7	Jl	11	·29	1	Au	9○	·82
3499	455	320	17M	·9682	16·0975	23·751	**398**	7	Ap	3	·07	1	My	2	·60	3	Je	1	·13	4	Je	30	·66	6	Jl	30○	·19
3500	456	321	18M	·2269	5·2058	19·908	**399**	4	Mr	23	·43	5	Ap	21	·96	7	My	21	·49	3	Jl	19●	·55	5	Au	18	·09
																2	Je	20	·02								
3501	457	322	17M	·4857	23·8447	18·042	**400**	3	Ap	10	·33	4	My	9	·86	6	Je	8○	·39	7	Jl	7●	·92	2	Au	6	·45
3502	458	323	17M	·7444	12·9530	14·199	**401**	7	Mr	30	·70	2	Ap	29	·23	3	My	28○	·76	5	Je	27	·29	6	Jl	26	·82
3503	459	324	18M	·0032	2·0613	10·356	**402**	5	Mr	20	·06	6	Ap	18	·59	2	Je	16	·66	4	Jl	16	·19	5	Au	14	·72
												1	My	18●○	·13												
3504	460	325	18M	·2620	20·7001	8·489	**403**	3	Ap	7	·96	5	My	7●	·49	7	Je	6	·02	2	Jl	5	·55	3	Au	4	·08
3505	461	326	17M	·5207	9·8084	4·647	**404**	1	Mr	27○	·33	2	Ap	25	·86	4	My	25	·39	6	Je	24	·92	7	Jl	23	·45
3506	462	327	17M	·7795	28·4473	2·780	**405**	7	Ap	15	.23	1	My	14	.76	2	Je	13	·29	4	Jl	12	·82	6	Au	11	·35
3507	463	328	18M	·0382	17.5556	26·492	**406**	4	Ap	4	·59	6	My	4	·12	7	Je	2	·65	2	Jl	2	·19	3	Jl	31	·72
3508	464	329	18M	·2970	6·6639	22·649	**407**	1	Mr	24	·96	3	Ap	23	·49	5	My	23	·02	6	Je	21	·55	2	Au	19●	·62
																				1	Jl	21	·08				
3509	465	330	17M	·5557	25·3028	20·782	**408**	7	Ap	11	·86	2	My	11	·39	3	Je	9	·92	5	Jl	9○	·45	6	Au	7	·98
3510	466	331	17M	·8145	14·4111	16·939	**409**	5	Ap	1	·23	6	Ap	30	·76	1	My	30	·29	2	Je	28●○	·82	4	Jl	28	·35
3511	467	332	18M	·0732	3·5194	18·097	**410**	2	Mr	21	·59	4	Ap	20	·12	5	My	19	·65	1	Jl	17	·71	3	Au	16	·25
																7	Je	18●	·18								
3512	468	333	18M	·3320	22·1583	11·230	**411**	1	Ap	9	·49	3	My	9○	·02	4	Je	7	·55	6	Jl	7	·08	1	Au	5	·61
3513	469	334	17M	·5908	11·2666	7·387	**412**	5	Mr	28	·86	7	Ap	27○	·39	1	My	26	·92	3	Je	25	·45	4	Jl	24	·98
3514	470	335	17M	·8495	0·8749	3·544	**413**	3	Mr	18	·22	6	My	16	·28	7	Je	14	·82	2	Jl	14	·35	3	Au	12	·88
								4	Ap	16○	·75																
3515	471	336	18M	·1083	19·0188	1·678	**414**	2	Ap	6●	·12	3	My	5	·65	5	Je	4	·18	6	Jl	3	·71	1	Au	2	·24
3516	472	337	18M	·3670	8·1221	25·390	**415**	6	Mr	26	·49	1	Ap	25	·02	2	My	24	·55	4	Je	23	·08	5	Jl	22	·61
																								7	Au	21○	·14
3517	473	338	17M	·6258	26·7610	23·523	**416**	5	Ap	13	·39	6	My	12	·92	1	Je	11	·45	2	Jl	10	·98	4	Au	9○	·51
3518	474	339	17M	·8845	15·8693	19·680	**417**	2	Ap	2	·75	4	My	2	·28	5	My	31	·81	7	Je	30	·34	1	Jl	29	·88
3519	475	340	18M	·1433	4·9776	15·887	**418**	7	Mr	23	·12	1	Ap	21	·65	3	My	21	·18	6	Jl	19●	·24	7	Au	17	·77
																4	Je	19	·71								
3520	476	341	18M	·4021	23·6164	13·971	**419**	6	Ap	11	·02	7	My	10	·55	2	Je	9○	·08	3	Jl	8	·61	5	Au	7	·14
3521	477	342	17M	·6608	12·7247	10·128	**420**	3	Mr	30	·38	4	Ap	28	·92	6	My	28○	·45	7	Je	26	·98	2	Jl	26	·51
3522	478	343	17M	·9196	1·8330	6·285	**421**	7	Mr	19	·75	2	Ap	18	·28	5	Je	16	·34	6	Jl	15	·87	1	Au	14	·40
												3	My	17	·81												
3523	479	344	18M	·1783	20·4719	4·418	**422**	6	Ap	7○	·65	1	My	7	·18	2	Je	5	·71	4	Jl	5	·24	5	Au	3	·77
3524	480	345	18M	·4371	9·5802	0·576	**423**	4	Mr	28○	·02	5	Ap	26	·55	7	My	26	·03	1	Je	24	·61	3	Jl	24	·14
3525	481	346	17M	·6958	28·2191	26·263	**424**	2	Ap	14	·91	4	My	14	·44	5	Je	12	·98	7	Jl	12	·51	2	Au	11	·04
3526	482	347	17M	·9546	17·3274	22·421	**425**	7	Ap	4	·28	1	My	3	·81	3	Je	2	·34	4	Jl	1	·87	6	Jl	31	·40
3527	483	348	18M	·2134	6·4357	18·578	**426**	4	Mr	24	·65	6	Ap	23	·18	7	My	22	·74	2	Je	21	·24	5	Au	19●	·30
																				3	Jl	20○	·77				
3528	484	349	18M	·4721	25·0746	16·711	**427**	3	Ap	12	·55	5	My	12	·08	6	Je	10	·61	1	Jl	10●○	·14	2	Au	8	·67

* Ending moments of tithis are the same by Ārya siddhānta

from 1 B.C. to A.D. 500 (Sūrya siddhānta)*—*cont.*

	Āśvina.				Kārttika.				Mārgaśirsha.				Pausha.			A.D.	Māgha.			A.D.	Phālguna			Chaitra.		
	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
	7	S	12	·03	1	O	11○	·56	3	N	10●	·09	4	D	9	·62												
	4	Au	31	·40	5	S	29○	·93	7	O	29	·46	1	N	27	·99												
	3	S	19○	·30	4	O	18	·83	6	N	17	·36	7	D	16	·89												
	7	S	8●	·66	2	O	8	·19	3	N	6	·72	5	D	6	·25												
	5	Au	29●	·03	6	S	27	·56	1	O	27	·09	2	N	25	·62												
	3	S	15	·93	5	O	15	·46	8	N	13	·99	1	D	13	·52												
	1	S	5	·29	2	O	4	·83	4	N	3	·36	5	D	2	·89												
	5	Au	25	·66	7	S	24	·19	1	O	23	·72	3	N	22○	·25												
	4	S	13	·56	6	O	13	·09	7	N	11●○	·62	2	D	11	·15												
	1	S	1	·93	3	O	1	·46	4	O	30○	·99	6	N	29	·52												
	6	Au	22	·29	7	S	20	·82	2	O	20	·35	3	N	18	·89												
	5	S	10○	·19	6	O	9	·72	1	N	8	·25	2	D	7	·78												
	2	Au	30○	·56	4	S	29	·09	5	O	28	·62	7	N	27	·15												
	1	S	17	·46	2	O	16	·99	4	N	15	·52	6	D	15	·05												
	5	S	6	·82	7	O	6	·35	1	N	4	·88	3	D	4	·41												
	3	Au	27	·19	4	S	25	·72	6	O	25	·25	7	N	23	·78												
	2	S	15	·09	3	O	14	·62	5	N	13	·15	6	D	12○	·68												
	6	S	3	·45	7	O	2	·99	2	N	1	·52	4	D	1	·05												
	3	Au	23	·82	5	S	22	·35	6	O	21○	·88	1	N	20●	·41												
	2	S	11	·72	4	O	11○	·25	5	N	9	·78	7	D	9	·31												
	7	S	1	·09	1	S	30○	·62	3	O	30	·15	4	N	28	·68												
	5	S	18	·98	7	O	18	·51	2	N	17	·05	3	D	16	·58												
	3	S	8	·35	4	O	7	·88	6	N	6	·41	7	D	5	·94												
	7	Au	28	·72	2	S	27	·25	3	O	26	·78	5	N	25	·31												
	6	S	16	·62	1	O	16	·15	2	N	14	·68	4	D	14	·21												
	3	S	4	·98	5	O	4	·51	7	N	3	·04	1	D	2○	·57												
	1	Au	25	·35	2	S	23	·88	4	O	23	·41	5	N	21○	·94												
	7	S	13	·25	1	O	12	·78	3	N	11●○	31	4	D	10	·84												
	4	S	2	·61	6	O	2	·15	7	O	31	·68	2	N	30	·21												
	1	Au	21	·98	3	S	20○	·51	**Mārgasira Kshaya**				6	N	18	·57												
					5	O	20	·04																				
	7	S	9○	·88	2	O	9	·41	3	N	7	·94	5	D	7	·47												
	5	Au	30○	·25	6	S	28	·78	1	O	28	·31	2	N	26	·84												
	4	S	18	·14	5	O	17	·67	7	N	16	·21	1	D	15	·74												
	1	S	6	·51	3	O	6	·04	4	N	4	·57	6	D	4	·10												
	5	Au	26	·88	7	S	25	·41	1	O	24	·94	3	N	23	·47												
	4	S	14	·78	6	O	14	·31	7	N	12	·84	2	D	12●	·37												
	2	S	4	·14	3	O	3	·67	5	N	2○	·20	6	D	1	·73												
	6	Au	23	·51	1	S	22	·04	2	O	21○	·57	4	N	20	·10												
	5	S	11	·41	6	O	10●○	·94	1	N	9	·47	3	D	9	·00												
	2	Au	31	·77	4	S	30●	·30	5	O	29	·84	7	N	28	·37												
	1	S	19●	·67	3	O	19	·20	4	N	17	·73	6	D	17	·26												
	6	S	8	·04	7	O	7	·57	2	N	6	·10	3	D	5	·63												
	3	Au	28	·41	4	S	26	·94	6	O	26	·47	1	N	25	·00												
	2	S	16	·30	3	O	15	·83	5	N	14	·36	6	D	13○	·90												
	6	S	5	·67	1	O	5	·20	2	N	3	·73	4	D	3●○	·26												
	4	Au	25	·04	5	S	23	·57	7	O	23	·10	1	N	21○	·63												
	2	S	12	·94	4	O	12	·47	6	N	11●	·00	7	D	10	·53												
	7	S	2	·30	1	O	1○	·83	2	O	31	·36	4	N	29	·89												
	4	Au	22	·67									**Pausha Kshaya**															
	6	S	21○	·20	7	O	20	·73	2	N	19	·26																
	3	S	9○	·57	5	O	9	·10	6	N	7	·63	1	D	7	·16												
	7	Au	29●	·93	2	S	28	·46	4	O	28	·00	5	N	26	·53												
	6	S	17	·83	1	O	17	·36	2	N	15	·89	4	D	15	·42												
	4	S	7	·20	5	O	6	·73	7	N	5	·26	1	D	4	·79												
76					6	Jr	8	15									7	F	6	·68	2	Mr	7	·21				
					3	D	27	·52									5	Jr	26	·05	6	F	24	·58				
77																	3	F	13	·95	5	Mr	15	·48				
78					2	Jr	15	·42									1	F	3○	·32	2	Mr	4	·85				
79					6	Jr	4	·70									5	Jr	23●○	68	7	F	22	·21				
					4	D	25	·15									4	F	10	·58	6	Mr	12	·11				
80																	1	Jr	30	·95	3	Mr	1	·48				
81					3	Jr	12●○	05									6	Jr	20	·31	7	F	18	·85				
82					7	Jr	1●	·42									5	F	8	·21	6	Mr	8	74				
					4	D	21	·78																				
83																	2	Jr	27	·58	4	F	26	·11				
84					3	Jr	9	·68									6	Jr	16	·95								
					1	D	29	·05									1	F	15	·48	3	Mr	17○	·01				
85																	5	F	4	·84	7	Mr	6●○	37				
86					5	D	18	·42									3	Jr	25	·21	4	F	23	·74				
87					4	Jr	6	·31									2	F	12	·11	3	Mr	13	·64				
					1	D	26	·68																				
88																	6	F	1	·48	1	Mr	3	·01				
89					7	Jr	13	·58									3	Jr	21	·84	5	F	20	·37				
90					4	Jr	2○	·95									2	F	9	·74	4	Mr	10	·27				
					2	D	23○	·31																				
91																	7	Jr	29	·11	1	F	27	·64				
92					1	Jr	11	·21									4	Jr	18	·47	6	F	17	·01				
93																												
94					5	D	30	·58									3	F	6	·37	4	Mr	7	·90				
					2	D	19	·94																				
95					1	Jr	7	·84									7	Jr	26	·74	2	F	25	·27				
					6	D	28	·21																				
96																	6	F	13○	·64	1	Mr	15	·17				
97					5	Jr	15	·11																				
98					2	Jr	4	·47									4	F	3○	·00	5	Mr	4	·53				
					6	D	24	·84									1	Jr	23○	·37	2	F	21	·90				
99																	7	F	11	·27	1	Mr	11	·80				
400					5	Jr	12	·74																				
01					3	Jr	1	·11									4	Jr	30	·64	6	Mr	1	·17				
					7	D	21	·47									2	Jr	20	·00	3	F	18	·53				
02																	7	F	7	·90	2	Mr	9	·43				
03					6	Jr	9	·37																				
					3	D	29	·74									5	Jr	28	·27	6	F	26	·80				
04																	2	Jr	16	·63								
05					1	D	18	·10									4	F	15	·17	5	Mr	16○	·70				
06					7	Jr	6	·00									1	F	4	·53	3	Mr	6○	·06				
					4	D	26	·37																				
07																	5	Jr	24	·90	7	F	23●	·43				
08					3	Jr	14○	·27									4	F	12●	·80	6	Mr	13	·33				
09					7	Jr	2○	·63									2	F	1	·16	3	Mr	2	·69				
					5	D	23○	·00																				
10																	6	Jr	21	·53	1	F	20	·06				
11					3	Jr	10	·90									5	F	9	·43	6	Mr	10	·96				
					1	D	31	·27																				
12					5	D	19	·63									2	Jr	29	·80	4	F	28	·33				
13																	7	Jr	18	·16	1	F	16	·69				
14					4	Jr	7	·53																				
					1	D	27	·90									6	F	6	·06	7	Mr	7	·59				
15																	3	Jr	26	·43	4	F	24○	·96				
16					7	Jr	15	·79																				
17					5	Jr	4	·16									2	F	14○	·32	3	Mr	14	·86				
					2	D	24	·53									6	F	2○	·69	1	Mr	4	·22				
18																	4	Jr	23	·06	5	F	21	·59				
19					1	Jr	12	·43									2	F	10	·96	4	Mr	12	·49				
20					5	Jr	1	·79									7	Jr	31	·32	1	F	29	·85				
					3	D	21	·16																				
21																	4	Jr	19	·69	6	F	18	·22				
22					2	Jr	9	·06									3	F	7	·59	5	Mr	9	·12				
					6	D	29	·42																				
23																	7	Jr	27	·96	2	F	26	·49				
24					3	D	18	·79									5	Jr	17	·32	6	F	15	·85				
																					1	Mr	16○	·38				
25					2	Jr	5	·69									4	F	4	·22	5	Mr	5●	·75				
					7	D	26	·06																				
26																	1	Jr	24○	·59	3	F	23	·12				
27					5	Jr	13○	·95									7	F	12	·48	2	Mr	14	·02				
28					3	Jr	3○	·32									4	F	1	·85	6	Mr	2	·38				

To mean ending moment of tithis add algebraically — ·02 for Brahma siddhānta.

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Commencement of solar year. Month and day A.D.	Commencement of solar year. Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaiśākha. Week-day.	Vaiśākha. Month.	Vaiśākha. Day.	Vaiśākha. Fraction.	Jyeshṭha. Week-day.	Jyeshṭha. Month.	Jyeshṭha. Day.	Jyeshṭha. Fraction.	Āshāḍha. Week-day.	Āshāḍha. Month.	Āshāḍha. Day.	Āshāḍha. Fraction.	Śrāvaṇa. Week-day.	Śrāvaṇa. Month.	Śrāvaṇa. Day.	Śrāvaṇa. Fraction.	Bhādrapada. Week-day.	Bhādrapada. Month.	Bhādrapada. Day.	Bhādrapada. Fraction.
3529	485	350	17M	·7309	14·1829	12·868	A.D. 428	7	Mr	31	·91	2	Ap	30	·44	3	My	29	·97	5	Je	28○	·50	7	Jl	28	·04
3530	486	351	17M	·9896	3·2912	9·026	429	5	Mr	21	·28	6 Ap 19 / 1 My 19○			·81 / ·34	2	Je	17	·87	4	Jl	17	·40	5	Au	15	·93
3531	487	352	18M	·2484	21·9301	7·159	430	4	Ap	9	·18	5	My	8○	·71	7	Je	7	·24	1	Jl	6	·77	3	Au	5	·30
3532	488	353	18M	·5071	11·0384	3·316	431	1	Mr	29	·54	3	Ap	28○	·08	4	My	27	·61	6	Je	26	·14	7	Jl	25	·67
3533	489	354	17M	·7659	0.1467	27·028	432	5 Mr 17 / 7 Ap 16●			·91 / ·44	1	My	15	·97	3	Je	14	·50	5	Jl	14	·03	6	Au	12	·56
3534	490	355	18M	·0246	18·7859	25·161	433	4	Ap	5	·81	6	My	5	·34	7	Je	3	·87	2	Jl	3	·40	3	Au	1	·93
3535	491	356	18M	·2834	7·8939	21·319	434	2	Mr	26	·18	3	Ap	24	·71	5	My	24	·24	6	Je	22	·77	1 Jl 22 / 2 Au 20○			·30 / ·83
3536	492	357	18M	·5422	26·5328	19·452	435	1	Ap	14	·07	2	My	13	·60	4	Je	12	·14	5	Jl	11	·67	7	Au	10●○	·20
3537	493	358	17M	·8009	15·6411	15·609	436	5	Ap	2	·44	6	My	1	·97	1	My	31	·50	3	Je	30	·03	4	Jl	29	·56
3538	494	359	18M	·0597	4·7494	11·766	437	2	Mr	22	·81	4	Ap	21	·34	5 My 20 / 7 Je 19○			·87 / ·40	1	Jl	18	·93	3	Au	17	·42
3539	495	360	18M	·3184	23·3882	9·900	438	1	Ap	10	.71	3	My	10	·24	4	Je	8○	77	6	Jl	8	·30	7	Au	6	·88
3540	496	361	18M	·5772	12·4965	6·057	439	6	Mr	31	·07	7	Ap	29	·60	2	My	29	·13	3	Je	27	·66	5	Jl	27	·20
3541	497	362	17M	·8359	1·6048	2·214	440	3	Mr	19	·44	4 Ap 17○ / 6 My 17●			·97 / ·50	1	Je	16	·03	2	Jl	15	·56	4	Au	14	·09
3542	498	363	18M	·0947	20·2437	0·347	441	2	Ap	7○	·34	3	My	6	·87	5	Je	5	·40	6	Jl	4	·93	1	Au	3	·46
3543	499	364	18M	·3535	9·3520	24·059	442	6	Mr	27○	·70	1	Ap	26	·24	2	My	25	·77	4	Je	24	·30	5 Jl 23 / 7 Au 22			·83 / ·36
3544	500	365	18M	·6122	27·9909	22·192	443	5	Ap	15	·60	7	My	15	·13	1	Je	13	·66	3	Jl	13	·19	4	Au	11	·72
3545	501	366	17M	·8710	17·0992	18·350	444	2	Ap	3	·97	4	My	3	·50	6	Je	2	·03	7	Jl	1	·56	2	Jl	31○	·09
3546	502	367	18M	·1297	6·2075	14·507	445	7	Mr	24	·34	1	Ap	22	·87	3	My	22	·40	4 Je 20 / 6 Jl 20○			·93 / ·46	7	Au	18	·99
3547	503	368	18M	·3885	24·8464	12·640	446	6	Ap	12	·23	7	My	11	·76	2	Je	10	·30	3	Jl	9●○	·83	5	Au	8	·36
3548	504	369	18M	·6472	13·9547	8·797	447	3	Ap	1	·60	5	My	1	·13	6	My	30○	·66	1	Je	29●	·19	2	Jl	28	·72
3549	505	370	17M	·9060	3·0630	4·955	448	7	Mr	20	·97	2 Ap 19 / 4 My 19○			·50 / ·03	5	Je	17	·56	7	Jl	17	·09	1	Au	15	·62
3550	506	371	18M	·1648	21·7018	3·088	449	6	Ap	8	·87	1	My	8●○	·40	2	Je	6	·93	4	Jl	6	·46	5	Au	4	·99
3551	507	372	18M	·4235	10·8102	26·800	450	4	Mr	29	·23	5	Ap	27	·76	7	My	27	·29	1	Je	25	·82	3	Jl	25	·36
3552	508	373	18M	·6823	29·4491	24·933	451	1 Mr 18○ / 3 Ap 17			·60 / ·13	4	My	16	·66	6	Je	15	·19	7	Jl	14	·72	2	Au	13	·25
3553	509	374	17M	·9410	18·5574	21·090	452	7	Ap	5	·50	2	My	5	·03	3	Je	3	·56	5	Jl	3	·09	6	Au	1	·62
3554	510	375	18M	·1998	7·8657	17·248	453	4	Mr	25	·86	6	Ap	24	·40	7	My	23	·93	2	Je	22	·46	3 Jl 21 / 5 Au 20○			·99 / ·52
3555	511	376	18M	·4585	26·3046	14·381	454	3	Ap	13	·76	5	My	13	·29	6	Je	11	·82	1	Jl	11	·35	2	Au	9●	·88
3556	512	377	18M	·7173	15·4128	11·538	455	1	Ap	3	·13	2	My	2	·66	4	Je	1	·19	5	Je	30○	·72	7	Jl	30●	·25
3557	513	378	17M	·9760	4·5211	7·695	456	5	Mr	22	·50	7	Ap	21	·03	1 My 20 / 3 Je 19○			·56 / ·09	4	Jl	18	·62	6	Au	17	·15
3558	514	379	18M	·2348	23·1600	5·829	457	4	Ap	10	·39	5	My	9	·92	7	Je	8●	·46	1	Jl	7	·99	3	Au	6	·52
3559	515	380	18M	·4036	12·2683	1·986	458	1	Mr	30	·76	3	Ap	29○	·29	4	My	28●	·82	6	Je	27	·35	7	Jl	26	·88
3560	516	381	18M	·7523	1·3766	25·698	459	6	Mr	20	·13	7 Ap 18○ / 2 My 18●			·66 / ·19	3	Je	16	·72	5	Jl	16	·25	6	Au	14	·78
3561	517	382	18M	·0111	20·0155	23·831	460	5	Ap	7●○	·03	6	My	6	·56	1	Je	5	·09	2	Jl	4	·62	4	Au	3	·15
3562	518	383	18M	·2698	9·1238	19·988	461	2	Mr	27●	·39	3	Ap	25	·92	5	My	25	·45	6	Je	23	·98	1 Jl 23 / 3 Au 22			·52 / ·05
3563	519	384	18M	·5286	27·7627	18·121	462	1	Ap	15	·29	2	My	14	·82	4	Je	13	·35	5	Jl	12	·88	7	Au	11○	·41
3564	520	385	18M	·7873	16·8710	14·279	463	5	Ap	4	·66	7	My	4	·19	1	Je	2	·72	3	Jl	2	·25	4	Jl	31○	·78
3565	521	386	18M	·0461	5·9793	10·436	464	3	Mr	24	·02	4	Ap	22	·56	6	My	22	·09	7 Je 20 / 2 Jl 20●○			·93 / ·15	3	Au	18	·68
3566	522	387	18M	·3049	24·6182	8·569	465	1	Ap	11	·92	3	My	11	·45	4	Je	9○	·98	6	Jl	9○	·51	1	Au	8	·04
3567	523	388	18M	·5836	13·7242	4·726	466	6	Ap	1	·29	7	Ap	30	·82	2	My	30○	·35	3	Je	28	·88	5	Jl	28	·41
3568	524	389	18M	·8224	2·8347	0·884	467	3	Mr	21	·66	5 Ap 20 / 6 My 19●○			·19 / ·72	1	Je	18	·25	2	Jl	17	·78	4	Au	16	·31
3569	525	390	18M	·0811	21·4737	26·571	468	2	Ap	8	·55	4	My	8●	·08	5	Je	6	·62	7	Jl	6	·15	1	Au	4	·68
3570	526	391	18M	·3399	10·5826	22·729	469	6	Mr	28○	·92	1	Ap	27	·45	2	My	26	·98	4	Je	25	·51	6	Jl	25	·04
3571	527	392	18M	·5986	29·2209	20·862	470	4 Mr 18○ / 5 Ap 16			·29 / ·82	7	My	16	·35	1	Je	14	·88	3	Jl	14	·41	4	Au	12	·94
3572	528	393	18M	·8574	18·3292	17·019	471	3	Ap	6	·19	4	My	5	·72	6	Je	4	·25	7	Jl	3	·78	2	Au	2	·31
3573	529	394	18M	·1162	7·4375	13·176	472	7	Mr	25	·55	2	Ap	24	·08	3	My	23	·61	5	Je	22	·14	6 Jl 21 / 1 Au 20●			·68 / ·21
3574	530	395	18M	·3749	26·0763	11·310	473	6	Ap	18	·45	7	My	12	·98	2	Je	11	·51	4	Jl	11○	·04	5	Au	9	·57
3575	531	396	18M	·6337	15·1846	7·467	474	3	Ap	2	·82	5	My	2	·35	6	My	31	·88	1	Je	30○	·41	2	Jl	29	·94
3576	532	397	18M	·8924	4·2929	3·624	475	1	Mr	23	·18	2	Ap	21	·72	4 My 21 / 5 Je 19●○			·25 / ·78	7	Jl	19	·31	1	Au	17	·84
3577	533	398	18M	·1512	22·9318	1·757	476	7	Ap	10	·08	1	My	9○	·61	3	Je	8	·14	4	Jl	7	·67	6	Au	6	·20
3578	534	399	18M	·4099	12·0401	25·469	477	4	Mr	30	·45	5	Ap	28○	·98	7	My	28	·51	2	Je	27	·04	3	Jl	26	·57
3579	535	400	18M	·6687	1·1484	21·627	478	1	Mr	19	·82	3 Ap 18○ / 4 My 17			·35 / ·88	6	Je	16	·41	7	Jl	15	·94	2	Au	14	·47
3580	536	401	18M	·9274	19·7873	19·760	479	7	Ap	7●	·71	2	My	7	·24	3	Je	5	·78	5	Jl	5	·31	6	Au	3	·84
3581	537	402	18M	·1862	8·8956	15·917	480	5	Mr	27	·08	6	Ap	25	·61	1	My	25	·14	2	Je	23	·67	4	Jl	23	·20

• The ending moments of tithis are the same by Ārya siddhānta.

from 1 B.C. to A.D. 500 (Sūrya siddhānta)*—*cont.*

	Āśvina.			Kārttika.			Mārgāśīrsha.			Pausha.	A.D.	Māgha.		A.D.	Phālguna.			Chaitra.		
	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.		Day.	Fraction.		Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
	1	Au	26	·57	3	S	25	·10	4	O	24	·63	6	N	23	·16			7	D	22	·69
	7	S	14	·46	1	O	13	·99	3	N	12○	·52	5	D	12●	·06						
	4	S	3	·83	6	O	3	·36	7	N	1○	·89	2	D	1	·42						
	2	Au	24	·20	3	S	22	·73	5	O	22○	·26	6	N	20	·79						
	1	S	11	·10	2	O	10●	·63	4	N	9	·16	5	D	8	·69						
	5	Au	31○	·46	6	S	29●	·99	1	O	29	·52	3	N	28	·05						
	4	S	19	·36	5	O	18	·89	7	N	17	·42	1	D	16	·95						
	1	S	8	·73	3	O	8	·26	4	N	6	·79	6	D	6	·32						
	6	Au	28	·09	7	S	26	·62	2	O	26	·16	3	N	24	·69						
	4	S	15	·99	6	O	15	·52	1	N	14	·05	2	D	13○	·58						
	2	S	5	·36	3	O	4	·89	5	N	3	·42	6	D	2●○	·95						
	6	Au	25	·73	1	S	24	·26	2	O	23	·79	4	N	22	·32						
	5	S	12	·62	7	O	12○	·15	1	N	10	·68	3	D	10	·22						
	2	S	1	·99	4	O	1○	·52	6	O	31	·05	7	N	29	·58						
	1	S	20●○	·89	3	O	20	·42	4	N	18	·95	6	D	18	·48						
	6	S	10	·26	7	O	9	·79	2	N	8	·32	3	D	7	·85						
	3	Au	29	·62	5	S	28	·15	6	O	27	·68	1	N	26	·21						
	2	S	17	·52	4	O	17	·05	5	N	15	·58	7	D	15	·11						
	6	S	6	·89	1	O	6	·42	2	N	4	·95	4	D	4	·48						
	4	Au	27	·25	5	S	25	·78	7	O	25	·32	1	N	23○	·85						
	3	S	14	·15	4	O	13	·68	6	N	12○	·21	7	D	11	·74						
	7	S	3	·52	2	O	3	·05	3	N	1○	·58	5	D	1	·11						
	4	Au	23	·89	6	S	22	·42	7	O	21	·95	2	N	20	·48						
	3	S	11○	·78	5	O	11	·31	6	N	9	·84	1	D	9	·38						
	1	Au	31○	·15	2	S	29	·68	4	O	29	·21	5	N	27	·74						
	7	S	19	·05	1	O	18	·58	3	N	17	·11	4	D	16	·64						
	4	S	8	·42	5	O	7	·95	7	N	6	·48	2	D	6	·01						
	1	Au	28	·78	3	S	27	·31	4	O	26	·84	6	N	25	·37						
	7	S	15	·68	2	O	15	·21	3	N	13	·74	5	D	13○	·27						
	5	S	5	05	6	O	4	·58	1	N	3	·11	2	D	2●	·64						
	2	Au	25	·41	3	S	23	·94	5	O	23○	·48	7	N	22	·01						
	1	S	13	·31	2	O	12●○	·84	4	N	11	·37	5	D	10	·90						
	5	S	1	·68	7	O	1○	·21	1	O	30	·74	3	N	29	·27						
	4	S	20●	·58	6	O	20	·11	7	N	18	·64	2	D	18	·17						
	1	S	9	·94	3	O	9	·47	5	N	8	·00	6	D	7	·54						
	6	Au	30	·31	7	S	28	·84	2	O	28	·37	3	N	26	·90						
	5	S	17	·21	6	O	16	·74	1	N	15	·27	2	D	14	·80						
	2	S	6	·58	4	O	6	·11	5	N	4	·64	7	D	4○	·17						
	6	Au	26	·94	1	S	25	·47	3	O	25	·00	4	N	23○	·53						
	5	S	14	·84	7	O	14	·37	1	N	12●○	·90	3	D	12	·43						
	3	S	3	·21	4	O	2	·74	6	N	1●	·27	7	N	30	·80						
	7	Au	23	·57	2	S	22○	·10	3	O	21●	·64	5	N	20	·17						
	6	S	11○	·47	1	O	11	·00	2	N	9	·53	4	D	9	·06						
	3	Au	31○	·84	5	S	30	·37	6	O	29	·90	1	N	28	·43						
	2	S	18	·74	4	O	18	·27	5	N	16	·80	7	D	16	·33						
	7	S	8	·10	1	O	7	·63	3	N	6	·16	4	D	5	·70						
	4	Au	28	·47	6	S	27	·00	7	O	26	·53	2	N	25	·06						
	3	S	16	·37	4	O	15	·90	6	N	14	·43	7	D	13●	·96						
	7	S	4	·74	2	O	4	·27	3	N	2○	·80	5	D	2	·33						
	5	Au	25	·10	6	S	23	·63	1	O	23○	·16	2	N	21	·69						
	4	S	13	·00	5	O	12○	·53	7	N	11	·06	1	D	10	·59						
	1	S	2	·37	2	O	1●	·90	4	O	31	·43	5	N	29	·96						
{	5	Au	21○	·73	1	O	19	·80	3	N	18	·33	4	D	17	·86						
{	7	S	20●	·26																		

	7	D	22	·69		29	2	Jr	21	·22	3	F	19	·75								
30	6	Jr	10	·59			1	F	9	·12	2	Mr	10	·65								
	3	D	30	·95		31	5	Jr	29	·48	7	F	28	·01								
	1	D	20	·32		32	2	Jr	18	·85	4	F	17	·38								
33	7	Jr	7	·22			1	F	5	·75	3	Mr	7○	·28								
	4	D	27	·58		34	6	Jr	26	·12	7	F	24●○	·65								
35	3	Jr	15	·48			5	F	14●○	·01	6	Mr	15	·54								
36	7	Jr	4	·85			2	F	3●	·38	3	Mr	3	·91								
	5	D	24○	·22		37	6	Jr	22	·75	1	F	21	·28								
38	4	Jr	12	·11			5	F	10	·64	7	Mr	12	·18								
39	1	Jr	1	·48			3	Jr	31	·01	4	Mr	1	·54								
	5	D	21	·85		40	7	Jr	20	·38	1	F	18	·91								
41	4	Jr	8	·75			6	F	7	·28	7	Mr	8	·81								
	2	D	29	·11		42	3	Jr	27	·64	5	F	26	·17								
43	1	Jr	17	·01			2	F	15	·54	4	Mr	17	·07								
44	5	Jr	6	·38			6	F	4○	·91	1	Mr	5	·44								
	2	D	25	·74		45	4	Jr	24○	·28	5	F	22	·81								
46	1	Jr	13●○	·64			3	F	12	·17	4	Mr	13	·70								
47	6	Jr	3	·01			7	F	1	·54	2	Mr	3	·07								
	3	D	23	·38		48	4	Jr	21	·91	6	F	20	·44								
49	2	Jr	10	·27			3	F	8	·80	5	Mr	10	·34								
	6	D	30	·64		50	1	Jr	29	·17	2	F	27	·70								
	4	D	20	·01		51	5	Jr	18	·54	7	F	17	·07								
52	2	Jr	7	·91			4	F	6	·44	5	Mr	6○	·97								
	7	D	27	·27		53	1	Jr	25	·80	3	F	24○	·33								
54	6	Jr	15	·17			7	F	13	·70	2	Mr	15	·23								
55	3	Jr	4○	·54			5	F	3	·07	6	Mr	4	·60								
	7	D	24○	·90		56	2	Jr	23	·44	3	F	21	·97								
57	6	Jr	11	·80			1	F	10	·33	2	Mr	11	·86								
58	4	Jr	1	·17			5	Jr	30	·70	7	Mr	1	·23								
	1	D	21	·54		59	3	Jr	20	·07	4	F	18	·60								
60	7	Jr	9	·43			1	F	7	·96	3	Mr	8	·50								
	4	D	28	·80		61	6	Jr	27	·33	7	F	25	·86								
62	3	Jr	16	·70			5	F	15○	·23	6	Mr	16●	·76								
63	1	Jr	6	·07			2	F	4○	·60	4	Mr	6	·13								
	5	D	26	·43		64	6	Jr	24○	·96	1	F	23	·49								
65	4	Jr	13●	·33			5	F	11	·86	7	Mr	13	·39								
66	1	Jr	2	·70			3	F	1	·23	4	Mr	2	·76								
	6	D	23	·06		67	7	Jr	21	·60	2	F	20	·13								
68	4	Jr	10	·96			6	F	9	·49	1	Mr	10	·02								
	2	D	30	·33		69	3	Jr	28	·86	5	F	27	·31								
	6	D	19	·70		70	1	Jr	18	·23	2	F	16	·76								
71	5	Jr	7	·59			7	F	6	·12	1	Mr	7○	·66								
	2	D	27	·96		72	4	Jr	26	·49	6	F	25	·02								
73	1	Jr	14○	·86			3	F	13	·39	4	Mr	14	·92								
74	6	Jr	4●○	·23			7	F	2	·76	2	Mr	4	·29								
	3	D	24○	·59		75	5	Jr	23	·12	6	F	21	·65								
76	2	Jr	12	·49			4	F	11	·02	5	Mr	11	·55								
	6	D	31	·86		77	1	Jr	30	·39	2	F	28	·92								
	4	D	21	·22		78	5	Jr	19	·76	7	F	18	·29								
79	3	Jr	9	·12			4	F	7	·65	6	Mr	9	·18								
	7	D	29	·49		80	2	Jr	28	·02	3	F	26○	·55								
81	6	Jr	16	·39			7	F	14○	·92	2	Mr	16	·45								

To mean ending moment of tithis, add algebraically ·02 for Brahma siddhānta.

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Month and day A.D.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaiśākha.			Jyeshṭha.			Āshāḍha.			Śrāvaṇa.			Bhādrapada.		
					Commencement of solar year.			Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
							A.D.																
3582	538	403	18M	·4450	27·5345	14·050	**481**	3	Ap	14	·98	5	My	14	·51	7	Je	13	·04	1	Jl	12	·57	3	Au	11●○	·10
3583	539	404	18M	·7037	16·6428	10·208	**482**	1	Ap	4	·35	2	My	3	·88	4	Je	2	·41	5	Jl	1	·94	7	Jl	31○	·47
3584	540	405	18M	·9625	5·7511	6·865	**483**	5	Mr	24	·71	7	Ap	23	·24	1	My	22	·77	3 Je		21○	·30	6	Au	19	·37
																				4 Jl		20	·84				
3585	541	406	18M	·2212	24·3900	4·498	**484**	4	Ap	11	·61	5	My	11	·14	7	Je	9○	·67	2	Jl	9	·20	3	Au	7	·73
3586	542	407	18M	·4800	13·4983	0·655	**485**	1	Mr	31	·98	3	Ap	30	·51	5	My	30○	·04	6	Je	28	·57	1	Jl	28	·10
3587	543	408	18M	·7387	2·6061	24·367	**486**	6	Mr	21	·34	7 Ap		19	·88	3	Je	17	·94	5	Jl	17	·47	7	Au	16	·00
												2 My		19●	·41												
3588	544	409	18M	·9975	21·2455	22·500	**487**	5	Ap	9○	·24	6	My	8●	·77	1	Je.	7	·30	2	Jl	6	·83	4	Au	5	·36
3589	545	410	18M	·2563	10·3538	18·658	**488**	2	Mr	28●○	·61	4	Ap	27	·14	5	My	26	·67	7	Je	25	·20	1	Jl	24	·73
3590	546	411	18M	·5150	28·9927	16·791	**489**	1	Ap	16	·51	3	My	16	·04	4	Je	14	·57	6	Jl	14	·10	7	Au	12	·63
3591	547	412	18M	·7738	18·1010	12·948	**490**	5	Ap	5	·87	7	My	5	·40	1	Je	3	·94	3	Jl	3	·47	5	Au	2	·00
3592	548	413	19M	·0325	7·2092	9·105	**491**	3	Mr	26	·24	4	Ap	24	·77	6	My	24	·30	7	Je	22	·83	2 Jl		22○	·36
																								3 Au		20●	·89
3593	549	414	18M	·2913	25·8481	7·239	**492**	2	Ap	13	·14	3	My	12	·67	5	Je	11	·20	6	Jl	10○	·73	1	Au	9	·26
3594	550	415	18M	·5500	14·9564	3·396	**493**	6	Ap	2	·51	1	My	2	·04	2	My	31	·57	4	Je	30○	·10	5	Jl	29	·63
3595	551	416	18M	·8088	4·0647	27·108	**494**	3	Mr	22	·87	5	Ap	21	·40	6 My		20○	·93	3	Jl	19	·00	4	Au	17	·53
																1 Je		19●	·46								
3596	552	417	19M	·0675	22·7086	25·241	**495**	2	Ap	10	·77	4	My	10○	·30	5	Je	8	·83	7	Jl	8	·36	1	Au	6	·89
3597	553	418	18M	·3263	11·8119	21·398	**496**	7	Mr	30	·14	1	Ap	28○	·67	3	My	28	·20	4	Je	26	·73	6	Jl	26	·26
3598	554	419	18M	·5851	0·9202	17·556	**497**	4	Mr	19	·50	6 Ap		18	·04	2	Je	16	·10	3	Jl	15	·63	5	Au	14	·11
												7 My		17	·57												
3599	555	420	18M	·8438	19·5591	15·689	**498**	3	Ap	7	·40	4	My	6	·93	6	Je	5	·46	7	Jl	4	·99	2	Au	3	·52
3600	556	421	19M	·1026	8·6674	11·846	**499**	7	Mr	27	·77	2	Ap	26	·30	3	My	25	·83	5	Je	25	·36	6	Jl	23	·89

ĀRYA SIDDHĀNTA

3601	557	422	18M	·2611	27·28318	9·612	**500**	6	Ap	14	·65	1	My	11	·18	2	Je	12	·71	4	Jl	12	·24	5	Au	10○	·77
3602	558	423	18M	·6198	16·39162	5·770	**501**	4	Ap	4	·02	5	My	3	·54	7	Je	2	·08	1	Jl	1	·61	3	Jl	31●	·40
3603	559	424	18M	·8785	5·50004	1·928	**502**	1	Mr	24	·38	2	Ap	22	·91	4 My		22	·44	7	Jl	20●	·50	2	Au	19	·03
																5 Je		20○	·97								
3604	560	425	19M	·1371	24·13907	0·062	**503**	7	Ap	12	·28	1	My	11	·81	3	Je	10●○	·34	4	Jl	9	·87	6	Au	8	·40
3605	561	426	18M	·3958	13·24751	23·774	**504**	4	Mr	31	·65	6	Ap	30	·18	7	My	29	·71	2	Je	28	·24	3	Jl	27	·77
3606	562	427	18M	·6545	2·35594	19·932	**505**	2	Mr	21	·01	3 Ap		19○	·54	5	Je	17	·61	1	Jl	17	·14	2	Au	15	·67
												5 My		19●	·07												
3607	563	428	18M	·9132	20·99497	18·068	**506**	7	Ap	8○	·91	2	My	8	·44	3	Je	6	·97	5	Jl	6	·50	7	Au	5	·03
3608	564	429	19M	·1719	10·10341	14·224	**507**	5	Mr	29○	·28	6	Ap	27	·81	1	My	27	·34	2	Je	25	·87	4	Jl	25	·40
3609	565	430	18M	·4305	28·74242	12·357	**508**	4	Ap	16	·18	5	My	15	·71	7	Je	14	·24	1	Jl	13	·77	3	Au	12	·30
3610	566	431	18M	·6892	17·85086	8·515	**509**	1	Ap	5	·64	3	My	5	·07	4	Je	3	·60	6	Jl	3	·13	7	Au	1○	·66
3611	567	432	18M	·9479	6·95930	4·673	**510**	5	Mr	25	·91	7	Ap.	24	·44	1	My	23	·97	3 Je		22	·50	6	Au	20	·56
																				5 Jl		22○	·03				
3612	568	433	19M	·2066	25·59832	2·806	**511**	4	Ap	13	·81	6	My	13	·34	7	Je	11	·87	2	Jl	11○	·40	3	Au	9	·93
3613	569	434	18M	·4653	14·70676	26·518	**512**	2	Ap	2	·17	3	My	1	·70	5	My	31○	·24	6	Je	29●	·77	1	Jl	29	·30
3614	570	435	18M	·7240	3·81519	22·677	**513**	6	Mr	22	·54	1	Ap	21	·07	2 My		20○	·60	5	Jl	18	·66	6	Au	17	·19
																4 Je		19●	·14								
3615	571	436	18M	·9826	22·45421	20·810	**514**	5	Ap	10	·44	6	My	9●○	·97	1	Je	8	·50	3	Jl	8	·03	4	Au	6	·56
3616	572	437	19M	·2413	11·56265	16·968	**515**	2	Mr	30	·81	4	Ap	29	·34	5	My	28	·87	7	Je	27	·40	1	Jl	26	·93
3617	573	438	18M	·5000	0·67109	13·126	**516**	7 Mr		19○	·17	3	My	17	·23	4	Je	15	·76	6	Jl	15	·30	7	Au	13	·83
								1 Ap		17●	·70																
3618	574	439	18M	·7587	19·31011	11·260	**517**	6	Ap	7●	·07	7	My	6	·60	2	Je	5	·13	3	Jl	4	·66	5	Au	3	·19
3619	575	440	19M	·0174	8·41855	7·417	**518**	3	Mr	27	·44	4	Ap	25	·97	6	My	25	·50	1	Je	24	·03	2 Jl		23	·56
																								4 Au		22●○	·09
3620	576	441	19M	·2760	27·05757	5·551	**519**	2	Ap	15	·34	3	My	14	·87	5	Je	13	·40	6	Jl	12	·93	1	Au	11●	·46
3621	577	442	18M	·5347	16·16600	1·709	**520**	6	Ap	3	·70	1	My	3	·23	2	Je	1	·76	4	Jl	1○	·29	5	Jl	30	·82
3622	578	443	18M	·7934	5·27444	25·421	**521**	4	Mr	24	·07	5	Ap	22	·60	7 My		22	·13	3	Jl	20	·19	4	Au	18	·72
																1 Je		20●○	·66								
3623	579	444	19M	·0521	23·91347	23·555	**522**	2	Ap	11	·97	4	My	11	·50	6	Je	10●	·03	7	Jl	9	·56	2	Au	8	·09
3624	580	445	19M	·3108	13·02189	19·713	**523**	7	Ap	1	·33	1	Ap	30○	·86	3	My	30	·40	4	Je	28	·93	6	Jl	28	·46
3625	581	446	18M	·5694	2·13033	15·870	**524**	4	Mr	20	·70	6 Ap		19○	·23	2	Je	17	·29	4	Jl	16	·82	5	Au	15	·35
												7 My		18	·76												
3626	582	447	18M	·8281	20·76936	14·004	**525**	3	Ap	8○	·60	5	My	8	·13	6	Je	6	·66	1	Jl	6	·19	2	Au	4	·72
3627	583	448	19M	·0868	9·87779	10·162	**526**	7	Mr	28	·97	2	Ap	27	·50	4	My	27	·03	5	Je	25	·56	7	Jl	25	·09
3628	584	449	19M	·3455	28·51682	8·295	**527**	6	Ap	16	·86	1	My	16	·39	2	Je	14	·92	4	Jl	14	·46	5	Au	12○	·99
3629	585	450	18M	·6042	17·62526	4·453	**528**	4	Ap	5	·23	5	My	4	·76	7	Je	3	·29	1	Jl	2	·82	3	Au	1○	·35
3630	586	451	18M	·8628	6·73368	0·611	**529**	1	Mr	25	·60	3	Ap	24	·13	4	My	23	·66	6 Je		22	·19	2	Au	20	·25
																				7 Jl		21●○	·72				
3631	587	452	19M	·1215	25·37271	26·299	**530**	7	Ap	13	·50	2	My	13	·03	3	Je	11	·56	5	Jl	11	·09	6	Au	9	·62
3632	588	453	19M	·3802	14·48115	22·457	**531**	4	Ap	2	·86	6	My	2	·39	7	My	31○	·92	2	Je	30●	·45	3	Jl	29	·98
3633	589	454	18M	·6389	3·58958	18·614	**532**	2	Mr	22	·23	3	Ap	20	76	5 My		20○	·29	1	Jl	18	·35	2	Au	16	·88
																6 Je		18	·82								

* For Sūrya siddhānta figures for A.D. 500 to
Ending moments of tithis are the same for Ārya and Sūrya siddhāntas.

from 1 B.C. to A.D. 500 (Sūrya siddhānta)[a]—*cont.*

Āśvina.				Kārttika.				Mārgaśīrsha.				Pausha.		A.D.	Māgha.			A.D.	Phālguna.			Chaitra.		
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.		Day.	Fraction.			Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
4 S		9	·63	6 O		9	·16	7 N		7	·69	2 D		7	·22		3 Jr	5	·75		5 F	4○	·28	6 Mr		5	·82
2 Au		30	·00	3 S		28	·53	5 O		28	·06	6 N		26	·59		1 D	26	·12		2 Jr	24	·65	4 F		23	·18
7 S		17	·90	2 O		17	·43	3 N		15	·96	5 D		15○	·49		7 Jr	14●	·02		1 F	12	·55	3 Mr		13	·08
5 S		6	·26	6 O		5	·79	1 N		4	·32	2 D		3○	·86		4 Jr	2	·39		5 Jr	31	·92	7 Mr		2	·45
2 Au		26	·63	4 S		25	·16	5 O		24	·69	7 N		23●○	·22		1 D	22	·75		3 Jr	21	·28	4 F		19	·81
1 S		14	·53	3 O		14	·06	4 N		12●	·59	6 D		12	·12		7 Jr	10	·65		2 F	9	·18	3 Mr		10	·71
5 S		3	·90	7 O		3○	·43	1 N		1●	·96	3 D		1	·49		5 D	31	·02		6 Jr	29	·55	1 F		28	·08
3 Au		23	·26	4 S		21○	·79	7 N		19	·85	**Pausha Kshaya.**					2 D	19	·38		3 Jr	17	·92	5 F		16	·45
				6 O		21	·32																	6 Mr		17●○	·98
2 S		11●○	·16	3 O		10	·69	5 N		9	·22	6 D		8	·75		1 Jr	7	·28		2 F	5	·81	4 Mr		7●	·34
6 Au		31	·53	1 S		30	·06	2 O		29	·59	4 N		28	·12		5 D	27	·65		7 Jr	26○	·18	1 F		24●	·71
5 S		19	·42	6 O		18	·96	1 N		17	·49	3 D		17	·02		4 Jr	15○	·55		6 F	14	·08	7 Mr		14	·61
2 S		7	·79	4 O		7	·32	5 N		5	·85	7 D		5	·38		1 Jr	3●○	·91		3 F	2	·44	4 Mr		3	·98
7 Au		28	·16	1 S		26	·69	3 O		26	·22	4 N		24	·75		6 D	24	·28		1 Jr	22	·81	2 F		21	·34
6 S		16	·06	7 O		15	·59	2 N		14○	·12	3 D		13	·65		5 Jr	12	·18		6 F	10	·71	1 Mr		12	·24
3 S		5	·42	4 O		4	·95	6 N		3○	·48	1 D		3	·02		2 Jr	1	·55		4 Jr	31	·08	5 F		29	·61
7 Au		24	·79	2 S		23	·32	3 O		22●○	·85	5 N		21	·38		6 D	20	·91		1 Jr	19	·44	2 F		17	·97
6 S		12	·69	1 O		12	·22	2 N		10	·75	4 D		10	·28		5 Jr	8	·81		7 F	7	·34	1 Mr		8○	·87
4 S		2○	·06	5 O		1	·59	7 O		31	·12	1 N		29	·65		3 D	29	·18		4 Jr	27	·71	6 F		26○	·24
1 Au		22○	·42	4 O		20	·48	6 N		19	·01	7 D		18	·54		2 Jr	17	·06		3 F	15●○	·59	5 Mr		16	·12
2 S		20	·95																							

FROM A.D. 500 TO A.D. 999.

7 S		9	·30	1 O		8	·83	3 N		7	·36	4 D		6	·89		6 Jr	5	·42		7 F	3	·95	2 Mr		5	·48
4 Au		29	·67	6 S		28	·20	7 O		27	·73	2 N		26	·26		3 D	25○	·79		5 Jr	24	·32	6 F		22	·85
3 S		17	·56	5 O		17	·10	6 N		15	·63	1 D		15○	·16		2 Jr	13	·69		4 F	12	·22	5 Mr		13	·75
7 S		6	·93	2 O		6	·46	3 N		4	·99	5 D		4○	·52		7 Jr	3	·05		1 F	1	·58	3 Mr		2	·12
5 Au		26	·30	6 S		24	·83	1 O		24	·36	2 N		22	·89		4 D	22	·42		5 Jr	20	·95	7 F		19	·48
4 S		14	·20	5 O		13○	·73	7 N		12	·26	1 D		11	·79		3 Jr	10	·32		4 F	8	·79	6 Mr		10	·38
1 S		3	·56	3 O		3○	·09	4 N		1●	·62	6 D		1	·16		7 D	30	·69		2 Jr	29	·22	3 F		27	·75
5 Au		23	·93	7 S		22○	·46	3 N		20	·52	5 D		20	·05		**Māgha Kshaya.**				6 Jr	18	·58	2 Mr		17	·62
				2 O		21	·99														1 F	17	·10				
4 S		10●	·83	6 O		10	·36	7 N		8	·99	2 D		8	·42		3 Jr	6	·95		5 F	5○	·48	7 Mr		7	·01
2 Au		31●	·20	3 S		29	·73	5 O		29	·26	6 N		27	·79		1 D	27	·32		2 Jr	25○	·85	4 F		24	·38
1 S		19	·09	2 O		18	·62	4 N		17	·15	5 D		16	·68		7 Jr	15○	·22		1 F	13	·75	3 Mr		15	·28
5 S		8	·46	7 O		8	·09	1 N		6	·52	3 D		6	·05		4 Jr	4●	·58		6 F	3	·11	7 Mr		3	·84
2 Au		27	·83	4 S		26	·36	5 O		25	·89	7 N		24○	·42		1 D	23	·95		3 Jr	22	·48	5 F		21	·01
1 S		15	·72	3 O		15	·26	4 N		13○	·79	6 D		13	·32		7 Jr	11	·85		2 F	10	·38	3 Mr		11	·91
6 S		5	·09	7 O		4	·82	2 N		3○	·15	3 D		2	·68		5 Jr	1	·21		6 Jr	30	·74	1 Mr		1	·28
3 Au		25	·46	4 S		23	·99	6 O		23●	·52	1 N		22	·05		2 D	21	·58		4 Jr	20	·11	5 F		18	·64
2 S		12○	·36	3 O		11	·89	5 N		10	·42	6 D		9	·95		1 Jr	8	·48		3 F	7	·01	4 Mr		8○	·54
6 S		1○	·72	1 O		1	·25	2 O		30	·78	4 N		29	·32		5 D	28	·85		7 Jr	27	·38	1 F		25○	·91
5 S		20	·62	7 O		20	·15	1 N		18	·68	3 D		18	·21		4 Jr	16○	·74		6 F	15●	·27	7 Mr		16	·80
2 S		9	·99	4 O		9	·52	6 N		8	·05	7 D		7	·58		2 Jr	6○	·11		3 F	4	·64	5 Mr		5	·17
7 Au		29	·36	1 S		27	·89	3 O		27	·42	4 N		25	·95		6 D	25○	·48		1 Jr	24	·01	2 F		22	·54
6 S		17	·25	7 O		16	·78	2 N		15	·31	3 D		14●○	·84		5 Jr	13	·38		7 F	11	·91	1 Mr		13	·44
3 S		6	·62	5 O		6	·15	6 N		4	·68	1 D		4●	·21		2 Jr	2	·74		4 F	1	·27	5 Mr		2	·80
1 Au		26	·99	2 S		25	·52	4 O		25○	·05	5 N		23●	·58		7 D	23	·11		1 Jr	21	·64	3 F		20	·17
6 S		13	·88	1 O		13○	·42	2 N		11	·95	4 D		11	·48		6 Jr	10	·01		7 F	8	·54	2 Mr		10	·07
4 S		3	·25	5 O		2○	·78	7 N		1	·31	1 N		30	·84		3 D	30	·37		4 Jr	28	·90	6 F		27	·44
1 Au		23	·62	3 S		22●	·15	6 N		20	·21	**Pausha Kshaya**					7 D	19	·74		2 Jr	18	·27	5 Mr		18	·88
				4 O		21	·68														3 F	16○	·80				
7 S		11	·52	2 O		11	·05	3 N		9	·58	5 D		9	·11		6 Jr	7	·64		1 F	6●○	·77	2 Mr		6	·70
4 Au		30	·88	6 S		29	·41	7 O		23	·94	2 N		27	·48		4 D	27	·01		5 Jr	25○	·45	7 F		24	·07
3 S		18	·78	5 O		18	·31	6 N		16	·84	1 D		16	·37		2 Jr	14●	·90		4 F	13	·43	5 Mr		14	·96
1 S		8	·15	2 O		7	·68	4 N		6	·21	5 D		5○	·74		7 Jr	4	·27		1 F	2	·80	3 Mr		4	·33
5 Au		28	·52	7 S		27	·05	1 O		26	·58	3 N		25○	·11		4 D	24	·64		6 Jr	23	·17	7 F		21	·70
4 S		15	·41	5 O		14	·94	7 N		13●○	·47	2 D		13	·00		8 Jr	11	·54		5 F	10	·07	6 Mr		11	·60

A.D. 999 see pages 238 to 241 below.
For tithis by Brahma siddhānta add algebraically —·02 to the above.

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Commencement of solar year. Month and day A.D.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaiśākha.			Jyeshṭha.			Āshāḍha.			Śrāvaṇa.			Bhādrapada.		
							A.D.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
3634	590	455	18M	·8976	22·22861	16·749	**533**	1	Ap	10	·13	2	My	9●	·66	4	Je	8	·19	5	Jl	7	·72	7	Au	6	·25
3635	591	456	19M	·1562	11·33705	12·906	**534**	5	Mr	30○	·49	7	Ap	29●	·02	1	My	28	·56	3	Je	27	·09	4	Jl	26	·62
3636	592	457	19M	·4149	0·44547	9·064	**535**	2 Mr 19○ / 4 Ap 18			·86 / ·39	5	My	17	·92	7	Je	16	·45	1	Jl	15	·98	3	Au	14	·51
3637	593	458	18M	·6736	19·08450	7·198	**536**	1	Ap	6	·76	3	My	6	·29	4	Je	4	·82	6	Jl	4	·35	7	Au	2	·88
3638	594	459	18M	·9323	8·19294	3·356	**537**	6	Mr	27	·13	7	Ap	25	·66	2	My	25	·19	3	Je	23	·72	5 Jl 23 / 6 Au 21			·25 / ·78
3639	595	460	19M	·1910	26·83226	1·490	**538**	5	Ap	15	·02	6	My	14	·55	1	Je	13	·08	2	Jl	18○	·62	4	Au	11	15
3640	596	461	19M	·4496	15·94039	25·202	**539**	2	Ap	4	·39	3	My	3	·92	5	Je	2	·45	6	Jl	1○	·98	1	Jl	31	·51
3641	597	462	18M	·7083	5·04883	21·359	**540**	6	Mr	23	·76	1	Ap	22	·29	2 My 21 / 4 Je 20●			·82 / ·35	5	Jl	19	·88	7	Au	18	·41
3642	598	463	18M	·9670	23·68785	19·493	**541**	5	Ap	11	·66	7	My	11○	·19	1	Je	9●	·12	3	Jl	9	·25	4	Au	7	·78
3643	599	464	19M	·2257	12·79629	15·651	**542**	3	Ap	1	·02	4	Ap	30○	·55	6	My	30	·08	7	Je	28	·61	2	Jl	28	·14
3644	600	465	19M	·4844	1·90473	11·809	**543**	7	Mr	21	·39	1 Ap 19●○ / 3 My 19			·92 / ·45	4	Je	17	·95	6	Jl	17	·51	1	Au	16	·04
3645	601	466	18M	·7430	20·54375	9·942	**544**	6	Ap	8●	·29	7	My	7	·82	2	Je	6	·35	3	Jl	5	·88	5	Au	4	·41
3646	602	467	19M	·0017	9·65218	6·100	**545**	3	Mr	28●	·65	5	Ap	27	·28	6	My	26	·72	1	Je	25	·25	2	Jl	24	·78
3647	603	468	19M	·2604	28·29121	4·234	**546**	2	Ap	16	·55	4	My	16	·08	5	Je	14	·61	7	Jl	14	·14	1	Au	12○	·67
3648	604	469	19M	·5191	17·39964	0·392	**547**	6	Ap	5	·92	1	My	5	·45	2	Je	3	·98	4	Jl	3	51	6	Au	2○	·04
3649	605	470	18M	·7778	6·50808	24·104	**548**	4	Mr	25	·29	5	Ap	23	·82	7	My	23	·35	1 Je 21 / 3 Jl 21●			·88 / ·41	4	Au	19	·94
3650	606	471	19M	·0365	25·14711	22·238	**549**	3	Ap	13	·18	4	My	12	·71	6	Je	11○	·24	7	Jl	10	·78	2	Au	9	·31
3651	607	472	19M	·2951	14·25553	18·395	**550**	7	Ap	2	·55	2	My	2	·08	3	My	31○	·61	5	Je	30	·14	6	Jl	29	67
3652	608	473	19M	·5538	8·36397	14·553	**551**	4	Mr	22	·92	6	Ap	21	·45	7 My 20● / 2 Je 19			·98 / ·51	4	Jl	19	·64	5	Au	17	57
3653	609	474	18M	·8125	22·00300	12·688	**552**	3	Ap	9○	·82	5	My	9	·34	6	Je	7	·88	1	Jl	7	·41	2	Au	5	·04
3654	610	475	19M	0711	11·11143	8·845	**553**	1	Mr	30○	·18	2	Ap	28	·71	4	My	28	·24	5	Je	26	·77	7	Jl	26	·30
3655	611	476	19M	·3299	0·21987	5·012	**554**	5 Mr 19●○ / 7 Ap 18			·55 / ·08	1	My	17	·61	3	Je	16	·14	4	Jl	15	·67	6	Au	14	·20
3656	612	477	19M	·5885	18·85889	3·136	**555**	4	Ap	7	·45	5	My	6	·98	7	Je	5	·51	2	Jl	5	·04	3	Au	3	·57
3657	613	478	18M	·8472	7·96733	26·848	**556**	1	Mr	26	·81	3	Ap	25	·34	4	My	24	·88	6	Je	23	·41	7 Jl 22○ / 2 Au 21			·94 / ·47
3658	614	479	19M	·1059	26·60635	24·982	**557**	7	Ap	14	·71	2	My	14	·24	3	Je	12	·77	5	Jl	12○	·30	6	Au	10	·83
3659	615	480	19M	·3648	15·71472	21·140	**558**	5	Ap	4	·08	6	My	3	·61	1	Je	2	·14	2	Jl	1○	·67	4	Jl	31	·20
3660	616	481	19M	·6233	4·82383	17·298	**559**	2	Mr	24	·45	3	Ap	22	·98	5 My 22 / 7 Je 21●			·51 / ·04	1	Jl	20	·57	3	Au	19	·10
3661	617	482	18M	·8819	23·46225	15·431	**560**	1	Ap	11	·34	2	My	10○	·87	4	Je	9	·40	5	Jl	8	·94	7	Au	7	·47
3662	618	483	19M	·1406	12·57069	11·589	**561**	5	Mr	31	·71	7	Ap	30●○	·24	1	My	29	·77	3	Je	28	·30	4	Jl	27	·83
3663	619	484	19M	·3993	1·67912	7·747	**562**	3	Mr	21	·08	4 Ap 19● / 6 My 19			·61 / ·14	7	Je	17	·67	2	Jl	17	·20	3	Au	15	·73
3664	620	485	19M	·6580	20·51814	5·881	**563**	1	Ap	8	·98	3	My	8	·51	5	Je	7	·03	6	Jl	6	·56	1	Au	5	·10
3665	621	486	18M	·9167	9·42658	2·038	**564**	6	Mr	28	·34	7	Ap	26	·87	2	My	26	·40	3	Je	24	·93	5	Jl	24	·46
3666	622	487	19M	·1758	28·06561	27·727	**565**	5	Ap	16	·24	6	My	15	·77	1	Je	14	·30	2	Jl	13	·83	4	Au	12○	·36
3667	623	488	19M	·1440	17·17403	23·894	**566**	2	Ap	5	·61	4	My	5	·14	5	Je	3	·67	7	Jl	3	·20	1	Au	1●	·73
3668	624	489	19M	·8927	6·28248	20·042	**567**	6	Mr	25	·97	1	Ap	24	·50	3	My	24	·04	4 Je 22○ / 6 Jl 22●			·57 / ·10	7	Au	20	·33
3669	625	490	18M	·9514	24·92150	18·166	**568**	5	Ap	12	·85	7	My	12	·40	1	Je	10●○	·93	3	Jl	10	·46	4	Au	8	·99
3670	626	491	19M	·2101	14·02993	14·383	**569**	3	Ap	2	·74	4	My	1	·77	6	My	31○	·30	7	Je	29	·83	2	Jl	29	·34
3671	627	492	19M	·4687	3·18887	10·491	**570**	7	Mr	22	·61	2	Ap	21○	·13	3 My 20 / 5 Je 19			·66 / ·19	6	Jl	18	·73	1	Au	17	·26
3672	628	493	19M	·7274	21·77749	8·625	**571**	6	Ap	10○	·50	1	My	10	·03	2	Je	8	·56	4	Jl	8	·09	5	Au	6	·62
3673	629	494	18M	·9861	10·88582	4·783	**572**	3	Mr	29○	·87	5	Ap	28	·40	6	My	27	·93	1	Je	26	·46	2	Jl	25	·99
3674	630	495	19M	·2448	29·52484	0·941	**573**	1 Mr 19● / 2 Ap 17			·23 / ·77	4	My	17	·30	5	Je	15	·83	7	Jl	15	·36	1	Au	13	·89
3675	631	496	19M	·5035	18·03329	26·829	**574**	7	Ap	7	·13	1	My	6	·66	3	Je	5	·19	4	Jl	4	·72	6	Au	3○	·25
3676	632	497	19M	·7621	7·74172	22·787	**575**	4	Mr	27	·50	6	Ap	26	·03	7	My	25	·56	2	Je	24	·09	3 Jl 23○ / 5 Au 22			·62 / ·15
3677	633	498	19M	·0208	26·38074	20·920	**576**	3	Ap	14	·40	4	My	13	·93	6	Je	12	·46	1	Jl	11●○	·99	2	Au	10	·53
3678	634	499	19M	·2795	15·48918	17·078	**577**	7	Ap	3	·76	2	My	3	·29	3	Je	1	·83	7	Jl	1	·36	7	Jl	30	·89
3679	635	500	19M	·5382	4·59761	13·236	**578**	5	Mr	24	·13	6	Ap	22	·66	1 My 22○ / 3 Je 20			·19 / ·72	4	Jl	20	·25	5	Au	18	·78
3680	636	501	19M	·7969	23·23664	11·370	**579**	4	Ap	12	·03	5	My	11○	·56	7	Je	10	·09	1	Jl	9	·62	3	Au	8	·15
3681	637	502	19M	·0555	12·34508	7·527	**580**	1	Mr	31	·40	2	Ap	29	93	4	My	29	·46	5	Je	27	·99	7	Jl	27	·52
3682	638	503	19M	·3142	1·45351	3·684	**581**	5 Mr 20○ / 7 Ap 19			·76 / ·29	1	My	18	·82	3	Je	17	·35	4	Jl	16	·89	6	Au	15	·42
3683	639	504	19M	·5729	20·09253	1·819	**582**	4	Ap	8	·66	6	My	8	·19	7	Je	6	·72	2	Jl	6	·25	3	Au	4	·78
3684	640	505	19M	·8316	9·20097	25·528	**583**	2	Mr	29	·03	3	Ap	27	·56	5	My	27	·09	6	Je	25	·62	1 Jl 25 / 2 Au 23●○			·15 / ·68
3685	641	506	19M	·0903	27·83999	23·665	**584**	7	Ap	15	·93	2	My	15	·46	3	Je	13	·99	5	Jl	13	·52	7	Au	12	·85

* For Sūrya siddhānta figures for A.D. 500 to
Ending moments of tithis are the same for Ārya and Sūrya siddhāntas.

from A.D. 500 to A.D. 999 (Ārya siddhānta)*—*cont.*

Āśvina.			Kārttika.			Mārgaśīrsha.			Pausha.		A.D.	Māgha.			A.D.	Phālguna.			Chaitra.		
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
1	S	4	·78	3	O	4	·31	4	N	2	·84	6	D	2	·37		7	D	31	·90	34	2	Jr	30	·43	3	F	28	·96
6	Au	25	·15	7	S	23○	·68	2	O	23●	21	3	N	21	·74		5	D	21	·27	35	6	Jr	19	·80	1	F	18	·33
5	S	13●○	·04	6	O	12	·58	1	N	11	·11	2	D	10	·64	36	4	Jr	9	·17		5	F	7	·70	7	Mr	8○	·23
2	S	1○	·41	3	S	30	94	5	O	30	·47	7	N	29	·00		1	D	28	·53	37	3	Jr	27	·06	4	F	25	·60
1	S	20	·31	2	O	19	·84	4	N	18	·37	5	D	17	·90	38	7	Jr	16○	·43		1	F	14●	·96	3	Mr	16	·49
5	S	9	·68	7	O	9	·21	1	N	7	·74	3	D	7	·27	39	4	Jr	5○	·80		6	F	4	·38	7	Mr	5	·86
3	Au	30	·04	4	S	28	·57	6	O	28	·10	7	N	26	·64		2	D	26●○	·17	40	3	Jr	24	·70	5	F	23	·23
1	S	16	·94	3	O	16	·47	5	N	15	·00	6	D	14●	·53	41	1	Jr	13	·06		2	F	11	·59	4	Mr	13	·12
6	S	6	·31	7	O	5	·84	2	N	4○	·37	3	D	3	·90	42	5	Jr	2	·43		6	Jr	31	·96	1	Mr	2	·49
3	Au	26	·68	5	S	25	·21	6	O	24○	·74	1	N	23	·27		2	D	22	·80	43	4	Jr	21	·33	5	F	19	·86
2	S	14	·57	4	O	14●○	·10	5	N	12	·63	7	D	12	·16	44	1	Jr	10	·70		3	F	9	·23	4	Mr	9	·76
6	S	2	·94	1	O	2	·47	3	N	1	·00	4	N	30	·53		6	D	30	·06	45	7	Jr	28	·59	2	F	27○	·12
4	Au	23○	·31	5	S	21●	·84	1	N	19	·90	**Pausha Kshaya**					3	D	19	·43	46	4	Jr	17	·96				
				7	O	21	·37															6	F	16○	·49	1	Mr	18	·02
3	S	11	·20	4	O	10	·74	6	N	9	·27	7	D	8	·80	47	2	Jr	7	·32		3	F	5●○	·86	5	Mr	7	·39
7	Au	31	·55	2	S	30	·10	3	O	29	·63	5	N	28	·16		6	D	27	·69	48	1	Jr	26	·22	2	F	24	·76
6	S	18	·47	1	O	18	·00	2	N	16	·53	4	D	16○	·06	49	5	Jr	14	·59		7	F	13	·12	1	Mr	14	·65
3	S	7	·80	5	O	7	·37	6	N	5	·90	1	D	5●○	·43	50	2	Jr	3	·96		4	F	2	·49	6	Mr	4	·02
1	Au	28	·20	2	S	26	·73	4	O	26	·26	5	N	24●○	·80		7	D	24	·33	51	1	Jr	22	·86	3	F	21	·39
7	S	16	·14	1	O	15	·63	3	N	14	·16	4	D	13	·69	52	6	Jr	12	·22		7	F	10	·75	2	Mr	11	·28
4	S	4	·47	6	O	4○	·00	7	N	2	·53	2	D	2	·06		3	D	31	·59	53	5	Jr	30	·12	6	F	28	·65
1	Au	24	·84	3	S	23○	·37	4	O	22	·90	6	N	21	·43		7	D	20	·96	54	2	Jr	19	·49	4	F	18	·02
7	S	12○	·73	2	O	12	·26	3	N	10	·79	5	D	10	·32	55	6	Jr	8	·86		1	F	7	·39	2	Mr	8●	·92
5	S	2	·10	6	O	1	·63	1	O	31	·16	2	N	29	·69		4	D	29	·22	56	5	Jr	27○	·75	7	F	26	·28
4	S	20	·00	5	O	19	·53	7	N	18	·06	1	D	17	·59	57	3	Jr	16○	·12		4	F	14	·65	6	Mr	16	·18
1	S	9	·36	2	O	8	·90	4	N	7	·43	5	D	6	·96	58	7	Jr	5○	·49		2	F	4	·02	3	Mr	5	·55
5	Au	29	·73	7	S	28	·25	1	O	27	·79	3	N	26	·32		4	D	25	·85	59	6	Jr	24	·38	7	F	22	·92
4	S	17	·63	6	O	17	·15	7	N	15○	·69	2	D	15	·22	60	3	Jr	13	·75		5	F	12	·28	6	Mr	12	·81
2	S	6	·00	3	O	5	·53	5	N	4○	·06	6	D	3●	·59	61	1	Jr	2	·12		2	Jr	31	·65	4	Mr	2	·18
6	Au	26	·36	7	S	24	·89	2	O	24○	·42	3	N	22	·96		5	D	22	·49	62	7	Jr	21	·02	4	F	19	·55
5	S	14	·26	6	O	13●	·79	1	N	12	·32	2	D	11	·85	63	4	Jr	10	·38		5	F	8	·91	7	Mr	10○	·44
2	S	3○	·63	4	O	3●	·16	5	N	1	·69	7	D	1	·22		1	D	30	·75	64	3	Jr	29	·28	4	F	27○	·81
6	Au	22○	·99	3	O	21	·05	5	N	19	·58	**Pausha Kshaya**					6	D	19	·12	65	7	Jr	17	·65				
1	S	21	·52																			2	F	16○	·18	3	Mr	17	·71
5	S	10	·89	7	O	10	·42	1	N	8	·95	3	D	8	·48	66	5	Jr	7	·01		6	F	5●	·54	1	Mr	7	·07
3	Au	31	·26	4	S	29	·79	6	O	29	·32	7	N	27	·85		2	D	27○	·38	67	4	Jr	25	·91	5	F	24	·44
2	S	19	·16	3	O	18	·69	5	N	17	·22	6	D	16○	·75	68	1	Jr	15	·28		2	F	13	·81	4	Mr	14	·34
6	S	7	·20	1	O	7	·05	2	N	5	·59	4	D	5○	·12	69	5	Jr	3	·64		7	F	2	·18	1	Mr	3	·18
3	Au	27	·89	5	S	26	·42	6	O	25	·95	1	N	24●	·48		3	D	24	·01	70	4	Jr	22	·54	6	F	21	·07
2	S	15	·79	4	O	15○	·32	5	N	13	·85	7	D	13	·38	71	1	Jr	11	·91		3	F	10	·44	4	Mr	11	·97
7	S	5	·15	1	O	4○	·68	3	N	3	·21	4	D	2	·75	72	6	Jr	1	·28		7	Jr	30	·81	2	F	29	·34
4	Au	24	·52	6	S	23●○	·06	7	O	22	·58	2	N	21	·11		3	D	20	·64	73	5	Jr	19	·17	6	F	17	·70
3	S	12●	·42	4	O	11	·95	6	N	10	·48	1	D	10	·01	74	2	Jr	8	·54		4	F	7○	·07	5	Mr	8●	·60
7	S	1●	·79	2	O	1	·32	3	O	30	·85	5	N	29	·38		6	D	28	·91	75	1	Jr	27○	·44	2	F	25	·97
6	S	20	·68	1	O	20	·23	2	N	18	·74	4	D	18	·27	76	5	Jr	16○	·81		7	F	15	·34	1	Mr	15	·87
4	S	9	·05	5	O	8	·58	7	N	7	·11	1	D	6	·64	77	3	Jr	5●	·17		4	F	3	·70	6	Mr	5	·20
1	Au	22	·42	2	S	27	·95	4	O	27	·48	6	N	26○	·01		7	D	25●	·54	78	2	Jr	24	·07	3	F	22	·63
7	S	17	·31	1	O	16	·85	3	N	15○	·38	4	D	14	·91	79	6	Jr	13	·44		7	F	11	·97	2	Mr	13	·50
4	S	6	·68	3	O	6	·21	7	N	4○	·74	2	D	4	27	80	3	Jr	2	·80		5	F	1	·33	6	Mr	1	·87
2	Au	26	·05	3	S	24	·58	5	O	24●	·11	6	N	22	·64		1	D	22	·17	81	2	Jr	20	·70	4	F	19	·23
7	S	13○	·95	2	O	13	·48	4	N	12	·01	5	D	11	·54	82	7	Jr	10	·07		1	F	8	·60	3	Mr	10○	·13
5	S	3○	·31	6	O	2	·84	1	N	1	·37	2	N	30	·91		4	D	30	·44	83	6	Jr	28	·97	7	F	27○	·50
4	S	22	·21	5	O	21	·74	7	N	20	·27	1	D	19	·50	84	3	Jr	18	·33		4	F	16●	·86	6	Mr	17	·39
1	S	10	·58	3	O	10	·11	4	N	8	·64	6	D	8	·17	85	7	Jr	6○	·70		2	F	5	·23	3	Mr	6	·76

A.D. 999 see pages 238 to 241 below.
For tithis by Brahama Siddhanta add algebraically — ·02 to the above.

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Commencement of solar year. Month and day A.D.	Commencement of solar year. Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaiśākha. Week-day.	Vaiśākha. Month.	Vaiśākha. Day.	Vaiśākha. Fraction.	Jyeshṭha. Week-day.	Jyeshṭha. Month.	Jyeshṭha. Day.	Jyeshṭha. Fraction.	Āshāḍha. Week-day.	Āshāḍha. Month.	Āshāḍha. Day.	Āshāḍha. Fraction.	Śrāvaṇa. Week-day.	Śrāvaṇa. Month.	Śrāvaṇa. Day.	Śrāvaṇa. Fraction.	Bhādrapada. Week-day.	Bhādrapada. Month.	Bhādrapada. Day.	Bhādrapada. Fraction.
							A.D.																				
3686	642	507	19M	·3490	16·94843	19·823	585	5	Ap	5	·29	6	My	4	·82	1	Je	3	·35	2	Jl	2○	·88	4	Au	1●	·41
3687	643	508	19M	·6076	·6·05687	15·980	586	2	Mr	25	·66	4	Ap	24	·19	5	My	23	·72	7 Je 22○ / 1 Jl 21			·25 / ·78	3	Au	20	·31
3688	644	509	19M	·8663	24·69588	14·114	587	1	Ap	13	·16	3	My	13	·09	4	Je	11●○	·62	6	Jl	11	·15	7	Au	9	·68
3689	645	510	19M	·1250	13·80432	10·273	588	5	Ap	1	·92	7	My	1○	·45	1	My	30●	·99	3	Je	29	·52	5	Jl	29	·05
3690	646	511	19M	·3837	2·91276	6·430	589	3	Mr	22	·29	4 Ap 20○ / 6 My 20●			·82 / ·35	7	Je	18	·88	2	Jl	18	·41	3	Au	16	·24
3691	647	512	19M	·6424	21·55178	4·563	590	2	Ap	10○	·19	3	My	9	·72	5	Je	8	·25	6	Jl	7	·78	1	Au	6	·31
3692	648	513	19M	·9010	10·66022	0·721	591	6	Mr	30	·56	1	Ap	29	·09	2	My	28	·62	4	Je	27	·15	5	Jl	26	·68
3693	649	514	19M	·1597	29·29925	26·409	592	4 Mr 18● / 5 Ap 17			·92 / ·45	6	My	16	·98	1	Je	15	·51	3	Jl	15	·05	4	Au	13○	·58
3694	650	515	19M	·4184	18·40757	22·568	593	2	Ap	6	·82	4	My	6	·35	5	Je	4	·88	7	Jl	4	·41	1	Au	2○	·94
3695	651	516	19M	·6771	7·51611	18·725	594	7	Mr	27	·19	1	Ap	25	·75	3	My	25	·25	4	Je	23	·78	6 Jl 23●○ / 7 Au 21			·31 / ·84
3696	652	517	19M	·9358	26·15445	16·858	595	6	Ap	15	·09	7	My	14	·62	2	Je	13	·15	3	Jl	12	·68	5	Au	11	·21
3697	653	518	19M	·1944	15·26357	13·016	596	3	Ap	3	·45	4	My	2	·98	6	Je	1○	·51	1	Jl	1	·04	2	Jl	30	·57
3698	654	519	19M	·4531	4·37201	9·174	597	7	Mr	23	·22	2	Ap	22	·35	3 My 21○ / 5 Je 20			·88 / ·41	6	Jl	19	·94	1	Au	18	·47
3699	655	520	19M	·7118	23·01103	7·308	598	6	Ap	11	·72	1	My	11●	·25	2	Je	9	·78	4	Jl	9	·31	5	Au	7	·84
3700	656	521	19M	·9705	12·11946	3·466	599	4	Ap	1○	·08	5	Ap	30●	·62	7	My	30	·15	1	Je	28	·68	3	Jl	28	·21
3701	657	522	19M	·2292	1·22790	27·178	600	1 Mr 20○ / 2 Ap 18			·46 / ·99	4	My	18	·52	6	Je	17	·05	7	Jl	16	·58	2	Au	15	·11
3702	658	523	19M	·4878	19·86693	25·312	601	7	Ap	8	·36	1	My	7	·89	3	Je	6	·42	4	Jl	5	·95	6	Au	4	·48
3703	659	524	19M	·7465	8·97535	21·469	602	4	Mr	28	·72	6	Ap	27	·25	7	My	26	·79	2	Je	25	·32	3 Jl 24 / 5 Au 23			·85 / ·38
3704	660	525	20M	·0052	27·61438	19·603	603	3	Ap	16	·62	5	My	16	·15	6	Je	14	·68	1	Jl	14○	·21	2	Au	12	·74
3705	661	526	19M	·2639	16·72282	15·761	604	7	Ap	4	·99	2	My	4	·52	4	Je	3	·05	5	Jl	2○	·58	7	Au	1	·11
3706	662	527	19M	·5225	5·83125	11·919	605	5	Mr	25	·38	6	Ap	23	·89	1	My	23	·42	2 Je 21●○ / 4 Jl 21			·95 / ·48	6	Au	20	·01
3707	663	528	19M	·7812	24·47028	10·053	606	4	Ap	13	·25	5	My	12○	·78	7	Je	11●	·31	1	Jl	10	·85	3	Au	9	·38
3708	664	529	20M	·0399	13·57872	6·210	607	1	Ap	2	·62	3	My	2○	·15	4	My	31	·68	6	Je	30	·21	7	Jl	29	·74
3709	665	530	19M	·2986	2·68714	2·368	608	5	Mr	21	·99	7 Ap 20●○ / 2 My 20			·52 / ·05	3	Je	18	·58	5	Jl	18	·11	6	Au	16	·64
3710	666	531	19M	·5573	21·32617	0·502	609	4	Ap	9●	·89	6	My	9	·42	7	Je	7	·95	2	Jl	7	·48	4	Au	6	·01
3711	667	532	19M	·8160	10·43461	24·215	610	2	Mr	30	·25	3	Ap	28	·78	5	My	28	·31	6	Je	26	·84	1	Jl	26	·37
3712	668	533	20M	·0746	29·07363	22·348	611	6 Mr 19 / 1 Ap 18			·62 / ·15	2	My	17	·68	4	Je	16	·21	6	Jl	15	·74	7	Au	14○	·27
3713	669	534	19M	·3333	18·18207	18·506	612	5	Ap	6	·52	7	My	6	·05	1	Je	4	·58	3	Jl	4	·11	4	Au	2○	·64
3714	670	535	19M	·5920	7·29050	14·663	613	2	Mr	26	·88	4	Ap	25	·41	5	My	24	·95	7	Je	23	·48	2 Jl 23● / 3 Au 21			·01 / ·54
3715	671	536	19M	·8507	25·92952	12·797	614	1	Ap	14	·78	3	My	14	·31	4	Je	12○	·84	6	Jl	12	·37	7	Au	10	·90
3716	672	537	20M	·1094	15·03796	8·955	615	6	Ap	4	·15	7	My	3	·68	2	Je	2○	·21	3	Jl	1	·74	5	Jl	31	·27
3717	673	538	19M	·3680	4·14640	5·112	616	3	Mr	23	·52	5	Ap	22	·05	6 My 21●○ / 1 Je 20			·58 / ·11	2	Jl	19	·64	4	Au	18	·17
3718	674	539	19M	·6267	22·78542	3·246	617	2	Ap	11○	·41	3	My	10	·94	5	Je	9	·47	7	Jl	9	·01	1	Au	7	·54
3719	675	540	19M	·8854	11·89386	26·959	618	6	Mr	31●○	·78	1	Ap	30	·31	2	My	29	·84	4	Je	28	·37	5	Jl	27	·90
3720	676	541	20M	·1441	1·00229	23·116	619	4 Mr 21○ / 5 Ap 19			·15 / ·68	7	My	19	·21	1	Je	17	·74	3	Jl	17	·27	4	Au	15	·80
3721	677	542	19M	·4028	19·64131	21·250	620	3	Ap	8	·04	4	My	7	·58	6	Je	6	·11	7	Jl	5	·64	2	Au	4	·17
3722	678	543	19M	·6614	8·74975	17·408	621	7	Mr	28	·41	1	Ap	26	·94	3	My	26	·47	5	Je	25	·00	6 Jl 24○ / 1 Au 23			·53 / ·07
3723	679	544	19M	·9201	27·38878	15·542	622	6	Ap	16	·31	7	My	15	·84	2	Je	14	·37	3	Jl	13○	·90	5	Au	12	·43
3724	680	545	20M	·1788	16·49720	11·699	623	3	Ap	5	·68	5	My	5	·21	6	Je	3	·74	1	Jl	3○	·27	2	Au	1	·80
3725	681	546	19M	·4375	5·60564	7·857	624	1	Mr	25	·06	2	Ap	23	·57	4	My	23○	·11	5 Je 21 / 7 Jl 21			·64 / ·17	1	Au	19	·70
3726	682	547	19M	·6962	24·24467	5·990	625	6	Ap	12	·94	1	My	12○	·47	3	Je	11	·00	4	Jl	10	·53	6	Au	9	·06
3727	683	548	19M	·9548	13·35310	2·149	626	4	Ap	2	·31	5	My	1○	·84	7	My	31	·37	1	Je	29	·90	3	Jl	29	·43
3728	684	549	20M	·1213	2·46154	25·861	627	1	Mr	22	·68	3 Ap 21● / 4 My 20			·21 / ·74	6	Je	19	·27	7	Jl	18	·80	2	Au	17	·33
3729	685	550	19M	·4722	21·10057	23·985	628	7	Ap	9●	·57	2	My	9	·10	3	Je	7	·63	5	Jl	7	·17	6	Au	5	·70
3730	686	551	19M	·7309	10·20899	20·153	629	4	Mr	29	·94	6	Ap	28	·47	1	My	28	·00	2	Je	26	·53	4	Jl	26	·06
3731	687	552	19M	·9896	28·84802	18·286	630	3	Ap	17	·84	5	My	17	·37	6	Je	15	·90	1	Jl	15	·43	2	Au	13●○	·96
3732	688	553	20M	·2483	17·95646	14·444	631	1	Ap	7	·21	2	My	6	·74	4	Je	5	·27	5	Jl	4	·80	7	Au	3	·33
3733	689	554	19M	·5069	7·06489	10·602	632	5	Mr	26	·56	7	Ap	25	·10	1	My	24	·63	3 Je 23○ / 4 Jl 22			·16 / ·69	6	Au	21	·23
3734	690	555	19M	·7656	25·70392	8·735	633	4	Ap	14	·47	6	My	14	·00	7	Je	12●○	·53	2	Jl	12	·06	3	Au	10	·59
3735	691	556	20M	·0243	14·81236	4·893	634	1	Ap	3	·84	3	My	3	·37	4	Je	1○	·90	6	Jl	1	·43	7	Jl	30	·96
3736	692	557	20M	·2830	3·92078	1·051	635	6	Mr	24	·20	7	Ap	22○	·73	2 My 22 / 3 Je 20			·27 / ·88	5	Jl	20	·33	6	Au	18	·86

* For Sūrya siddhānta figures for A.D. 500 to
Ending moments of tithis are the same for Arya Sūrya Siddhāntas.

from A.D. 500 to A.D. 999 (Ārya siddhānta)*—*cont.*

Āśvina.			Kārttika.			Mārgaśīrsha.			Pausha.			A.D.	Māgha.			A.D.	Phālguna.			Chaitra.		
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.	
5	Au	30	·95	7	S	29	·48	2	O	29	·01		3 N	27	·54		5	D	27○	·07	**86**	6	Jr	25	·60	1	F	24	·13
4	S	18	·84	6	O	18	·37	7	N	16	·90		2 D	16●○	·39	**87**	3	Jr	14	·97		5	F	13	·50	7	Mr	15	·08
2	S	8	·21	3	O	7	·74	5	N	6	·27		6 D	5	·80	**88**	1	Jr	4	·33		2	F	2	·86	4	Mr	3	·39
6	Au	27	·58	1	S	26	·11	3	O	25○	·64		4 N	24	·17		5	D	23	·70	**89**	7	Jr	22	·23	1	F	20	·76
5	S	15	·47	7	O	15●○	·01	1	N	13	·54		3 D	13	·07	**90**	4	Jr	11	·60		6	F	10	·13	7	Mr	11	·66
2	S	4	·84	4	O	4●○	·37	5	N	2	·90		7 D	2	·43	**91**	2	D	31	·96	**91**	3	Jr	30	·49	5	Mr	1	·03
7	Au	25	·21	1	S	23●	·74	3	O	23	·27		4 N	21	·80	**92**	6	D	21	·33	**92**	7	Jr	19	·86	2	F	18○	·39
6	S	12	·11	7	O	11	·64	2	N	10	·17		3 D	9	·70	**93**	5	Jr	8	·23		6	F	6○	·73	1	Mr	8	·29
3	S	1	·47	5	O	1	·00	6	O	30	·53		1 N	29	·07		2	D	28	·60	**94**	4	Jr	27●○	·13	5	F	25	·66
2	S	20	·37	3	O	19	·90	5	N	18	·43		6 D	17	·96	**95**	1	Jr	16●	·55		3	F	15	·02	4	Mr	16	·55
6	S	9	·74	1	O	9	·27	2	N	7	·80		4 D	7○	·33	**96**	5	Jr	5	·86		7	F	4	·39	1	Mr	4	·92
4	Au	29	·12	5	S	27	·64	7	O	27	·17		1 N	25○	·70		3	D	25●	·23	**97**	4	Jr	23	·76	6	F	22	·29
3	S	17	·00	4	O	16	·53	6	N	15○	·06		7 D	14	·59	**98**	2	Jr	13	·13		3	F	11	·66	5	Mr	13	·19
7	S	6	·37	1	O	5	·90	3	N	4	·43		4 D	3	·96	**99**	6	Jr	2	·49		1	F	1	·02	2	Mr	2	·55
4	Au	26	·74	6	S	25○	·27	7	O	24	·80		2 N	23	·33		6	D	22	·86	**600**	5	Jr	21	·39	6	F	19	·92
3	S	13○	·64	5	O	13	·17	6	N	11	·70		1 D	11	·23	**01**	2	Jr	9	·77		4	F	8	·30	5	Mr	9●○	·83
1	S	3○	·01	2	O	2	·54	4	N	1	·07		5 N	30	·60		7	D	30	·13	**02**	1	Jr	28	·66	3	F	27	·19
6	S	21	·91	1	O	21	·44	2	N	19	·97		4 D	19	·50	**03**	6	Jr	18○	·03		7	F	16	·56	2	Mr	18	·09
4	S	11	·27	5	O	10	·81	7	N	9	·34		1 D	8	·87	**04**	3	Jr	7●○	·40		4	F	5	·93	6	Mr	6	·46
1	Au	30	·64	3	S	29	·17	4	O	28	·70		6 N	27	·23		7	D	26●○	·16	**05**	2	Jr	25	·29	3	F	23	·83
7	S	18	·54	2	O	18	·07	3	N	16	·60		5 D	16	·13	**06**	6	Jr	14	·66		1	F	13	·19	2	Mr	14	·72
4	S	7	·91	6	O	7	·44	7	N	5○	·97		2 D	5	·50	**07**	4	Jr	4	·03		5	F	2	·56	7	Mr	4	·09
2	Au	28	·27	3	S	26	·80	5	O	26○	·33		6 N	24	·87		1	D	24	·40	**08**	2	Jr	22	·93	4	F	21	·46
1	S	15	·17	2	O	14○	·70	4	N	13	·23		5 D	12	·76	**09**	7	Jr	11	·29		7	F	9	·82	3	Mr	11	·35
5	S	4	·54	7	O	4	·07	1	N	2	·60		3 D	2	·13		4	D	31	·66	**10**	5	Jr	30	·19	7	F	28○	·72
2	Au	24○	·91	4	S	23	·44	Mārgaśīrsha Kshaya					7 N	21	·50		2	D	21	·03	**11**	3	Jr	19	·56	6	F	18○	·09
				5	O	22	·97																						
1	S	12	·80	3	O	12	·33	4	N	10	·86		6 D	10	·39	**12**	7	Jr	8	·93		2	F	7○	·46	3	Mr	7	·99
6	S	1	·17	7	S	30	·70	2	O	30	·23		3 N	28	·76		5	D	28	·29	**13**	6	Jr	26	·82	1	F	25	·35
5	S	20	·07	6	O	19	·60	1	N	18	·13		2 D	17○	·66	**14**	4	Jr	16	·19		5	F	14	·72	7	Mr	16	·25
2	S	9	·43	3	O	8	·97	5	N	7	·50		7 D	7○	·03	**15**	1	Jr	5	·56		3	F	4	·09	4	Mr	5	·62
6	Au	29	·80	1	S	28	·33	2	O	27	·86		4 N	26○	·39		5	D	25	·92	**16**	7	Jr	24	·45	2	F	23	·98
5	S	16	·70	7	O	16	·23	1	N	14●	·76		3 D	14	·29	**17**	4	Jr	12	·82		6	F	11	·35	7	Mr	12	·88
3	S	6	·07	4	O	5○	·60	6	N	4●	·13		7 D	3	·66	**18**	2	Jr	2	·19		3	Jr	31	·72	5	Mr	2	·25
7	Au	26	·43	1	S	24○	·96	3	O	24●	·49		5 N	23	·03		6	D	22	·56	**19**	1	Jr	21	·19	2	F	19	·62
6	S	14○	·33	7	O	13	·86	2	N	12	·39		3 D	11	·92	**20**	5	Jr	10	·45		6	F	8	·98	1	Mr	9●	·51
3	S	2●	·70	5	O	2	·23	6	O	31	·76		1 N	30	·29		2	D	29	·82	**21**	4	Jr	28○	·35	5	F	26	·88
2	S	21	·60	4	O	21	·13	5	N	19	·66		7 D	19	·19	**22**	1	Jr	17○	·72		3	F	16	·25	4	Mr	17	·78
6	S	10	·96	1	O	10	·49	3	N	9	·12		4 D	8	·55	**23**	6	Jr	7○	·09		7	F	5	·62	2	Mr	7	·15
4	Au	31	·33	5	S	29	·86	7	O	29	·39		1 N	27	·92		3	D	27●	·45	**24**	4	Jr	25	·98	6	F	24	·51
3	S	18	·23	4	O	17	·73	6	N	16○	·29		7 D	15●	·82	**25**	2	Jr	14	·35		3	F	12	·88	5	Mr	14	·41
7	S	7	·60	2	O	7	·13	3	N	5○	·66		5 D	5	·19	**26**	6	Jr	3	·72		1	F	2	·25	2	Mr	3	·78
4	Au	27	·96	6	S	26	·49	1	O	26●○	·02		2 N	24	·55		4	D	24	·08	**27**	5	Jr	22	·67	7	F	21	·15
3	S	15	·86	5	O	15●	·39	6	N	13	·92		1 D	13	·45	**28**	2	Jr	11	·98		4	F	10	·51	6	Mr	11○	·04
1	S	4○	·23	2	O	3●	·76	4	N	2	·29		5 D	1	·82		7	D	31	·35	**29**	1	Jr	29	·88	3	F	28○	·41
5	Au	24○	·59	1	O	22	·65	3	N	21	·19		Pausha Kshaya				4	D	20	·72	**30**	6	Jr	19	·25	7	F	17○	·78
7	S	23	·12																							2	Mr	19	·31
4	S	12	·49	6	O	12	·02	7	N	10	·55		2 D	10	·08	**31**	3	Jr	8	·61		5	F	7●	·14	6	Mr	8	·67
1	S	1	·86	3	O	1	·39	4	O	30	·92		6 N	29	·45		7	D	28○	·98	**32**	2	Jr	27●	·51	4	F	26	·05
7	S	19	·76	2	O	19	·29	3	N	17	·82		5 D	17○	·35	**33**	6	Jr	15	·88		1	F	14	·41	2	Mr	15	·94
5	S	9	·12	6	O	8	·65	1	N	7	·18		2 D	6○	·71	**34**	4	Jr	5	·25		5	F	3	·78	7	Mr	5	·31
2	Au	29	·49	4	S	28	·02	5	O	27	·55		7 N	26●	·08		1	D	25	·61	**35**	3	Jr	24	·14	4	F	22	·67
1	S	17	·39	2	O	16○	·92	4	N	15	·45		5 D	14	·98	**36**	7	Jr	13	·51		2	F	12	·04	3	Mr	12	·57

A.D. 999 see pages 238 to 241 below.
For tithis by Brahma siddhānta add algebraically — ·02 to the above.

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Commencement of solar year.	Month and day A.D.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaiśākha.			Jyeshṭha.			Āshāḍha.			Śrāvaṇa.			Bhādrapada.		
									Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
								A.D.																
3737	693	558	19M	·5417	22·55981	26·739		636	5	Ap	11○	·10	6	My	10	·68	1	Je	9	·16	2	Jl	8	·69	4	Au	7	·22
3738	694	559	19M	·8003	11·66825	22·897		637	2	Mr	31●○	·47	4	Ap	30	·00	5	My	29	·53	7	Je	28	·07	1	Jl	27	·59
3739	695	560	20M	·0590	0·77698	19·055		638	6	Mr	20●	·84	2	My	18	·90	4	Je	17	·43	5	Jl	16	·96	7	Au	15	·49
									1	Ap	19	·37																
3740	696	561	20M	·3177	19·41570	17·188		639	5	Ap	8	·73	7	My	8	·26	1	Je	6	·79	3	Jl	6	·33	4	Au	4○	·86
3741	697	562	19M	·5764	8·52414	13·346		640	3	Mr	28	·10	4	Ap	26	·63	6	My	26	·16	7	Je	24	·69	2	Jl	24○	·22
																									3	Au	22	·75
3742	698	563	19M	·8351	27·16316	11·480		641	2	Ap	16	·00	3	My	15	·53	5	Je	14	·06	6	Jl	13○	·59	1	Au	12	·12
3743	699	564	20M	·0937	16·27180	7·638		642	6	Ap	5	·37	7	My	4	·90	2	Je	3	·43	3	Jl	2	·96	5	Au	1	·49
3744	700	565	20M	·3524	5·38004	3·795		643	3	Mr	25	·78	5	Ap	24	·26	6	My	23○	·79	2	Jl	21	·85	4	Au	20	·39
																	1	Je	22●	·32								
3745	701	566	19M	·6111	24·01906	1·929		644	2	Ap	12	·63	4	My	12○	·16	5	Je	10	·69	7	Jl	10	·22	1	Au	8	·75
3746	702	567	19M	·8698	13·12749	25·641		645	7	Ap	2	·00	1	My	1	·53	3	My	31	·06	4	Je	29	·59	6	Jl	29	·12
3747	703	568	20M	·1285	2·23593	31·799		646	4	Mr	22○	·36	5	Ap	20●	·89	1	Je	18	·96	3	Jl	18	·41	5	Au	17	·02
													7	My	20	·43												
3748	704	569	20M	·3871	20·87495	19·933		647	3	Ap	10	·26	4	My	9	·79	6	Je	8	·32	7	Jl	7	·85	2	Au	6	·39
3749	705	570	19M	·6458	9·98339	16·091		648	7	Mr	29	·63	2	Ap	28	·16	3	My	27	·69	5	Je	26	·22	6	Jl	25	·75
3750	706	571	19M	·9045	28·63242	14·234		649	6	Ap	17	·53	1	My	17	·06	2	Je	15	·59	4	Jl	15	·12	5	Au	13	·65
3751	707	572	20M	·1632	17·73084	10·383		650	3	Ap	6	·89	5	My	6	·42	6	Je	4	·95	1	Jl	4○	·49	3	Au	3●	·02
3752	708	573	20M	·4219	6·83928	6·540		651	1	Mr	27	·26	2	Ap	25	·79	4	My	25	·32	5	Je	23○	·85	1	Au	21	·91
																					7	Jl	23	·38				
3753	709	574	19M	·6805	25·47831	4·694		652	7	Ap	14	·16	1	My	13	·69	3	Je	12○	·22	4	Jl	11	·75	6	Au	10	·28
3754	710	575	19M	·9392	14·58074	0·831		653	4	Ap	3	·53	6	My	3	·06	7	Je	1●	·59	2	Jl	1	·12	3	Jl	30	·65
3755	711	576	20M	·1979	3·69518	24·544		654	1	Mr	23	·89	3	Ap	22○	·42	4	My	21	·95	1	Jl	20	·01	2	Au	18	·55
																	6	Je	20	·48								
3756	712	577	20M	·4566	22·38420	22·677		655	7	Ap	11●○	·79	2	My	11	·32	3	Je	9	·85	5	Jl	9	·38	6	Au	7	·91
3757	713	578	19M	·7153	11·44264	18·835		656	5	Mr	31	·16	6	Ap	29	·69	1	My	29	·22	2	Je	27	·75	4	Jl	27	·28
3758	714	579	19M	·9788	0·55107	14·993		657	2	Mr	20	·52	5	My	18	·59	7	Je	17	·12	1	Jl	16	·65	3	Au	15○	·18
									4	Ap	19	·05																
3759	715	580	20M	·2325	19·19003	13·127		658	1	Ap	8	·42	2	My	7	·95	4	Je	6	·48	6	Jl	6	·01	7	Au	4○	·54
3760	716	581	20M	·4913	8·29914	9·285		659	5	Mr	28	·79	7	Ap	27	·32	1	My	26	·85	3	Je	25	·38	4	Jl	24●○	·91
																									6	Au	23	·44
3761	717	582	19M	·7500	26·93756	7·418		660	4	Ap	15	·69	6	My	15	·22	7	Je	13	·75	2	Jl	13●	·28	3	Au	11	·81
3762	718	583	20M	·0087	16·04600	3·576		661	2	Ap	5	·05	3	My	4	·58	5	Je	3○	·11	6	Jl	2●	·65	1	Au	1	·18
3763	719	584	20M	·2673	5·15443	27·288		662	6	Mr	25	·42	7	Ap	23	·95	2	My	23●○	·48	5	Jl	21	·54	7	Au	20	·07
																	4	Je	22	·01								
3764	720	585	20M	·5260	23·79345	25·422		663	5	Ap	13	·32	6	My	12●	·85	1	Je	11	·38	2	Jl	10	·91	4	Au	9	·44
3765	721	586	19M	·7847	12·90189	21·580		664	2	Ap	1○	·69	4	My	1	·22	5	My	30	·75	7	Je	29	·28	1	Jl	28	·81
3766	722	587	20M	·0434	2·01033	17·737		665	7	Mr	22○	·05	1	Ap	20●	·58	4	Je	18	·64	6	Jl	18	·17	7	Au	16	·71
													3	My	20	·11												
3767	723	588	20M	·3021	20·64934	15·871		666	5	Ap	9	·95	7	My	9	·48	2	Je	8	·01	3	Jl	7	·54	5	Au	6	·07
3768	724	589	20M	·5608	9·73779	12·029		667	3	Mr	30	·32	4	Ap	28	·85	6	My	28	·38	7	Je	26	·91	2	Jl	26	·44
3769	725	590	19M	·8194	28·39681	10·163		668	2	Ap	17	·21	3	My	16	·75	5	Je	15	·28	6	Jl	14○	·81	1	Au	13	·34
3770	726	591	20M	·0781	17·50524	6·320		669	6	Ap	6	·58	1	My	6	·11	2	Je	4	·64	4	Jl	4○	·17	5	Au	2	·70
3771	727	592	20M	·3368	6·61368	2·478		670	3	Mr	26	·95	5	Ap	5	·48	7	My	25	·01	1	Je	23●○	·54	4	Au	21	·60
																					3	Jl	23	·07				
3772	728	593	20M	·5955	25·25280	0·612		671	2	Ap	14	·85	4	My	14	·38	5	Je	12	·91	7	Jl	12	·44	1	Au	10	·97
3773	729	594	19M	·8542	14·36113	24·324		672	7	Ap	3	·21	1	My	2○	·74	3	Je	1●	·27	4	Je	30	·81	6	Jl	30	·34
3774	730	595	20M	·1128	3·46957	20·483		673	4	Mr	23	·58	6	Ap	22○	·11	7	My	21	·64	3	Jl	19	·70	5	Au	18	·22
																	2	Je	20	·17								
3775	731	596	20M	·3715	22·10860	18·616		674	3	Ap	11●	·48	5	My	11	·01	6	Je	9	·54	1	Jl	9	·07	2	Au	7	·60
3776	732	597	20M	·6302	11·21703	14·773		675	7	Mr	31	·85	2	Ap	30	·38	3	My	29	·91	5	Je	28	·44	6	Jl	27	·97
3777	733	598	19M	·8889	0·32546	10·931		676	5	Mr	20	·21	1	My	18	·27	2	Je	16	·80	4	Jl	16	·33	6	Au	14○	·87
									6	Ap	18	·74																
3778	734	599	20M	·1476	18·26449	9·065		677	4	Ap	8	·11	5	My	7	·64	7	Je	6	·17	1	Jl	5	·70	3	Au	4○	·23
3779	735	600	20M	·4062	8·07292	5·223		678	1	Mr	28	·48	3	Ap	27	·01	4	My	26	·54	6	Je	25	·07	7	Jl	24●	·60
																									2	Au	23	·13
3780	736	601	20M	·6649	26·71195	3·356		679	7	Ap	16	·37	1	My	15	·91	3	Je	14○	·44	4	Jl	13●	·97	6	Au	12	·50
3781	737	602	19M	·9236	15·82039	27·069		680	4	Ap	4	·74	6	My	4	·27	7	Je	2○	·80	2	Jl	2	·33	3	Jl	31	·86
3782	738	603	20M	·1823	4·92832	23·226		681	2	Mr	25	·11	3	Ap	23	·64	5	My	23●	·17	1	Jl	21	·23	2	Au	19	·76
																	6	Je	21	·70								
3783	739	604	20M	·4410	23·58784	21·360		682	1	Ap	13	·01	2	My	12●	·54	4	Je	11	·07	5	Jl	10	·60	7	Au	9	·13
3784	740	605	20M	·6996	12·67628	17·518		683	5	Ap	2○	·37	6	My	1	·90	1	My	31	·43	2	Je	29	·97	4	Jl	29	·50
3785	741	606	19M	·9583	1·78471	13·676		684	2	Mr	21○	·74	4	Ap	20	·27	7	Je	18	·33	1	Jl	17	·86	3	Au	16	·39
													5	My	19	·80												
3786	742	607	20M	·2170	20·42374	11·809		685	1	Ap	9	·64	3	My	9	·17	4	Je	7	·70	6	Jl	7	·23	7	Au	5	·76
3787	743	608	20M	·4757	9·53218	7·967		686	6	Mr	30	·01	7	Ap	28	·54	2	My	28	·07	3	Je	26	·60	5	Jl	26○	·13
3788	744	609	20M	·7344	28·17119	6·101		687	4	Ap	17	·90	6	My	17	·43	7	Je	15	·96	2	Jl	15○	·49	4	Au	14	·03

* For Sūrya siddhānta figures for A.D. 500 to
Ending moments of tithis are the samefor Ārya and Sūrya siddhāntas.

from A.D. 500 to A.D. 999 (Ārya siddhānta)*—*cont.*

Āśvina.				Kārttika.				Mārgaśīrsha.				Pausha.				A.D.	Māgha.			A.D.	Phālguna.			Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.		Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
5	S	5	·75	7	O	5○	·29	1	N	3	·82	3	D	3	·35	**37**	4	Jr	1	·88		6	Jr	31	·41	7	Mr	1	·94
3	Au	26	·12	4	S	24●○	·65	6	O	24	·18	7	N	22	·71		2	D	22	·24	**38**	3	Jr	20	·77	5	F	19	·30
2	S	14	·02	3	O	13	·55	5	N	12	·08	6	D	11	·61	**39**	1	Jr	10	·14		2	F	8○	·67	4	Mr	10	·20
6	S	3●	·39	7	O	2	·92	2	N	1	·45	4	N	30	·98		5	D	30	·51	**40**	7	Jr	29○	·04	1	F	27	·53
5	S	21	·28	6	O	20	·81	1	N	19	·35	2	D	18	·88	**41**	4	Jr	17●○	·41		5	F	15	·94	7	Mr	17	·40
2	S	10	·65	4	O	10	·18	5	N	8	·71	7	D	8	·24	**42**	1	Jr	6	·77		3	F	5	·30	4	Mr	6	·87
7	Au	31	·02	1	S	29	·55	3	O	29	·08	4	N	27○	·61		6	D	27●	·14	**43**	7	Jr	25	·67	2	F	24	·72
5	S	18	·92	7	O	18	·45	1	N	16●○	·98	3	D	16	·51	**44**	5	Jr	15	·04		6	F	13	·57	1	Mr	14	·10
3	S	7	·28	4	O	6	·81	6	N	5●○	·34	7	D	4	·87	**45**	2	Jr	3	·41		3	F	1	·94	5	Mr	3	·47
7	Au	27	·65	2	S	26	·18	3	O	25●	·71	5	N	24	·24		6	D	23	·77	**46**	1	Jr	22	·30	2	F	20	·83
6	S	15○	·55	1	O	15	·08	2	N	13	·61	4	D	13	·14	**47**	5	Jr	11	·67		7	F	10	·20	1	Mr	11○	·73
3	S	4○	·91	5	O	4	·45	6	N	2	·90	1	D	2	·51	**48**	3	Jr	1	·04		4	Jr	30	·57	6	F	29●○	·10
1	Au	24●○	·28	2 S 22 / 4 O 22			·81 / ·34	5	N	20	·87	7	D	20	·40	**49**	1	Jr	18	·93		3	F	17●	·47	5	Mr	19	·00
7	S	12	·18	1	O	11	·71	3	N	10	·24	4	D	9	·77	**50**	6	Jr	8○	·30		7	F	6	·83	2	Mr	8	·38
4	S	1	·55	6	O	1	·08	7	O	30	·61	2	N	29	·14		3	D	28○	·67	**51**	5	Jr	27●	·20	6	F	25	·73
3	S	20	·44	4	O	19	·97	6	N	18	·51	1	D	18●○	·04	**52**	2	Jr	16	·57		4	F	15	·10	5	Mr	15	·63
7	S	8	·81	2	O	8	·34	3	N	6	·87	5	D	6	·40	**53**	6	Jr	4	·93		1	F	3	·46	3	Mr	4	·99
5	Au	29	·18	6	S	27	·71	1	O	27○	·24	2	N	25●	·77		4	D	25	·30	**54**	5	Jr	23	·83	7	F	22	·36
4	S	17	·08	5	O	16○	·61	7	N	15	·14	1	D	14	·67	**55**	3	Jr	13	·20		4	F	11	·73	6	Mr	13	·26
1	S	6	·44	2	O	5○	·90	4	N	4	·50	6	D	4	·03	**56**	7	Jr	2	·57		2	F	1	·10	3	Mr	1	·63
5	Au	25	·81	7	S	24	·34	1	O	23	·87	3	N	22	·40		4	D	21	·93	**57**	6	Jr	20	·46	7	F	18○	·99
4	S	13	·71	6	O	13	·24	7	N	11	·77	2	D	11	·30	**58**	3	Jr	9	·83		5	F	8○	·36	6	Mr	9	·89
2	S	3●	·07	3	O	2	·61	5	N	1	·14	6	N	30	·67		1	D	30	·20	**59**	2	Jr	28○	·73	4	F	27	·26
7	S	21	·97	2	O	21	·50	4	N	20	·03	5	D	19	·56	**60**	7	Jr	18●	·09		1	F	16	·62	3	Mr	17	·16
5	S	10	·34	6	O	9	·87	1	N	8	·40	2	D	7○	·93	**61**	4	Jr	6	·46		5	F	4	·99	7	Mr	6	·59
2	Au	30	·71	4	S	29	·24	5	O	28	·77	7	N	27○	·30		1	D	26	·83	**62**	3	Jr	25	·36	4	F	23	·89
1	S	18	·60	3	O	18	·13	4	N	16○	·67	6	D	16	·20	**63**	7	Jr	14	·73		2	F	13	·26	3	Mr	14	·79
5	S	7	·98	7	O	7	·50	2	N	6	·03	3	D	5	·56	**64**	5	Jr	4	·09		6	F	2	·62	1	Mr	3	·15
2	Au	27	·34	4	S	25○	·87	6	O	25	·40	7	N	23	·98		2	D	23	·46	**65**	3	Jr	21	·99	5	F	20	·52
2	S	15○	·24	3	O	14	·77	5	N	13	·30	6	D	12	·83	**66**	1	Jr	11	·36		2	F	9	·89	4	Mr	11○	·42
6	S	4○	·60	1	O	4	·13	2	N	2	·66	4	D	2	·19		5	D	31	·73	**67**	7	Jr	30	·26	1	F	28	·79
4	Au	24●	·97	5 S 23 / 7 O 23			·50 / ·03	1	N	21	·56	3	D	21	·09	**68**	4	Jr	19○	·62		6	F	18	·15	7	Mr	18	·68
2	S	11	·87	4	O	11	·40	6	N	9	·93	7	D	9	·46	**69**	2	Jr	8○	·09		3	F	6	·52	5	Mr	8	·05
7	S	1	·23	1	S	30	·77	3	O	30	·30	4	N	28	·83		6	D	28○	·36	**70**	7	Jr	26	·89	2	F	25	·42
6	S	20	·13	7	O	19	·66	2	N	18	·19	3	D	17●	·72	**71**	5	Jr	16	·25		6	F	14	·79	1	Mr	16	·32
3	S	9	·50	5	O	9	·03	6	N	7○	·56	1	D	7●	·09	**72**	2	Jr	5	·62		4	F	4	·15	5	Mr	4	·68
7	Au	28	·87	2	S	27	·40	3	O	26○	·93	5	N	25●	·46		6	D	24	·99	**73**	1	Jr	23	·52	3	F	22	·05
6	S	16	·76	1	O	16○	·29	2	N	14	·83	4	D	14	·36	**74**	5	Jr	12	·89		7	F	11	·42	1	Mr	12	·95
4	S	6	·13	5	O	5●	·66	7	N	4	·19	1	D	3	·72	**75**	3	Jr	2	·25		4	Jr	31	·78	5	Mr	2○	·31
1	Au	26○	·50	3	S	25	·03	4	O	24	·56	6	N	23	·09		7	D	22	·62	**76**	2	Jr	21	·15	3	F	19○	·68
7	S	13	·40	1	O	12	·93	3	N	11	·46	4	D	10	·99	**77**	6	Jr	9	·52		1	F	8○	·05	2	Mr	9	·58
4	S	2	·76	6	O	2	·29	7	O	31	·82	2	N	30	·35		3	D	29	·89	**78**	5	Jr	28●	·42	6	F	26	·95
3	S	21	·66	5	O	21	·19	6	N	19	·72	1	D	19○	·25	**79**	2	Jr	17	·78		4	F	16	·31	5	Mr	17	·85
1	S	11	·03	2	O	10	·56	1	N	9	·09	5	D	8○	·62	**80**	7	Jr	7	·15		1	F	5	·68	3	Mr	6	·21
5	Au	30	·39	6	S	28	·93	1	O	28	·46	2	N	26●○	·99		4	D	26	·52	**81**	6	Jr	25	·05	7	F	23	·58
4	S	18	·29	5	O	17	·82	7	N	16●	·35	1	D	15	·88	**82**	3	Jr	14	·41		4	F	12	·95	6	Mr	14	·48
1	S	7	·66	3	O	7○	·19	4	N	5●	·72	6	D	5	·25	**83**	7	Jr	3	·78		2	F	2	·31	3	Mr	3	·84
6	Au	28	·03	7	S	26○	·56	2	O	26	·09	3	N	24	·62		5	D	24	·15	**84**	6	Jr	22	·68	1	F	21	·21
4	S	14○	·92	6	O	14	·45	7	N	12	·99	2	D	12	·52	**85**	4	Jr	11	·05		5	F	9	·58	7	Mr	11	·11
2	S	4	·29	3	O	3	·82	5	N	2	·35	6	D	1	·88		1	D	31	·41	**86**	2	Jr	29○	·94	4	F	28●	·47
6	Au	24	·68	1 S 23 / 2 O 22			·19 / ·72	4	N	21	·25	5	D	20	·78	**87**	7	Jr	19○	·31		1	F	17	·84	3	Mr	19	·37
5	S	12	·56	7	O	12	·09	1	N	10	·62	3	D	10	·15	**88**	4	Jr	8○	·68		6	F	7	·21	7	Mr	7	·74

A.D. 999 see pages 238 to 241 below.

For tithis by Brahma siddhānta add algebraically - -·02 to the above.

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Commencement of solar year. Month and day A.D.	Fraction of day.	First new moon in solar year	Anomaly of first new moon.	Christian era. A.D.	Vaiśākha. Week-day.	Month.	Day.	Fraction.	Jyeshṭha. Week-day.	Month.	Day.	Fraction.	Āshāḍha. Week-day.	Month.	Day.	Fraction.	Śrāvaṇa. Week-day.	Month.	Day.	Fraction.	Bhādrapada. Week-day.	Month.	Day.	Fraction.
3789	745	610	19M	·9930	17·27963	2·259	**688**	2	Ap	6	·27	3	My	5	·80	5	Je	4	·33	6	Jl	3●○	·86	1	Au	2	·39
3790	746	611	20M	·2517	6·38807	25·971	**689**	6	Mr	26	·64	1	Ap	25	·17	2	My	24	·70	4	Je	23	·23	7	Au	21	·29
																				5	Jl	22	·76				
3791	747	612	20M	·5104	25·02709	24·105	**690**	5	Ap	14	·53	7	My	14○	·07	1	Je	12	·60	3	Jl	12	·13	4	Au	10	·66
3792	748	613	20M	·7691	14·13553	20·262	**691**	2	Ap	3	·90	4	My	3○	·43	5	Je	1	·96	7	Jl	1	·49	2	Jl	31	·02
3793	749	614	20M	·0278	3·24397	16·420	**692**	7	Mr	23	·27	1	Ap	21●	·80	3	My	21	·33	6	Jl	19	·39	7	Au	17	·92
																4	Je	19	·86								
3794	750	615	20M	·2864	21·88298	14·554	**693**	6	Ap	11●	·17	7	My	10	·70	2	Je	9	·23	3	Jl	8	·76	5	Au	7	·29
3795	751	616	20M	·5451	10·99142	10·712	**694**	3	Mr	31	·53	5	Ap	30	·06	6	My	29	·59	1	Je	28	·13	2	Jl	27	·66
3796	752	617	20M	·8038	0·09985	6·869	**695**	2	Ap	19	·43	3	My	18	·96	5	Je	17	·49	7	Jl	17	·02	1	Au	15○	·55
3797	753	618	20M	·0625	18·73888	5·003	**696**	6	Ap	7	·80	1	My	7	·83	2	Je	5	·86	4	Jl	5	·39	5	Au	3	·92
3798	754	619	20M	·3212	7·84732	1·161	**697**	4	Mr	28	·17	5	Ap	26	·70	7	My	26	·23	1	Je	24○	·76	4	Au	22	·82
																				3	Jl	24	·29				
3799	755	620	20M	·5798	26·48634	26·849	**698**	3	Ap	16	·06	4	My	15	·59	6	Je	14○	·12	7	Jl	13	·65	2	Au	12	·19
3800	756	621	20M	·8385	15·59477	23·007	**699**	7	Ap	5	·43	1	My	4	·96	3	Je	3○	·49	5	Jl	3	·02	6	Au	1	·55
3801	757	622	20M	·0972	4·70321	19·164	**700**	4	Mr	24	·80	6	Ap	23	33	7	My	22●	·86	3	Jl	20	·92	5	Au	19	·45
																2	Je	21	·39								
3802	758	623	20M	·3559	23·34224	17·288	**701**	3	Ap	12○	·70	5	My	12	·23	6	Je	10	·76	1	Jl	10	·29	2	Au	8	·82
3803	759	624	20M	·6146	12·45066	13·456	**702**	1	Ap	2●○	·07	2	My	1	·60	4	My	31	·13	5	Je	29	·66	7	Jl	29	·19
3804	760	625	20M	·8733	1·55910	9·614	**703**	5	Mr	22●	·43	6	Ap	20	·97	3	Je	19	·03	4	Jl	18	·56	6	Au	17	·09
												1	My	20	·50												
3805	761	626	20M	·1319	20·19813	7·747	**704**	4	Ap	9	·33	5	My	8	·86	7	Je	7	·39	1	Jl	6	·92	3	Au	5○	·45
3806	762	627	20M	·3906	9·30656	3·905	**705**	1	Mr	29	·70	3	Ap	28	·23	4	My	27	·76	6	Je	26	·29	7	Jl	25●○	·82
3807	763	628	20M	·6493	27·94559	2·039	**706**	7	Ap	17	·60	2	My	17	·13	3	Je	15	·66	5	Jl	15○	·19	6	Au	13	·72
3808	764	629	20M	·9080	17·05403	25·751	**707**	4	Ap	6	·96	6	My	6	·49	1	Je	5	·03	3	Jl	4●	·56	4	Au	3	·09
3809	765	630	20M	·1667	6·16245	21·909	**708**	2	Mr	26	·33	3	Ap	24	·86	5	My	24○	·39	6	Je	22	·92	2	Au	20	·98
																				1	Jl	22	·45				
3810	766	631	20M	·4253	24·80148	20·043	**709**	1	Ap	14	·23	2	My	13●○	·76	4	Je	12	·29	5	Jl	11	·82	7	Au	10	·35
3811	767	632	20M	·6840	13·90992	16·201	**710**	5	Ap	3	·60	7	My	3○	·13	1	Je	1	·66	3	Jl	1	·19	4	Jl	30	·74
3812	768	633	20M	·9427	30·19835	12·358	**711**	2	Mr	23○	·96	4	Ap	22	·49	6	My	22	·02	2	Jl	20	·09	3	Au	18	·62
																7	Je	20	·55								
3813	769	634	20M	·2014	21·65738	10·492	**712**	1	Ap	10	·86	3	My	10	·39	4	Je	8	·92	6	Jl	8	·45	7	Au	6	·98
3814	770	635	20M	·4601	10·76581	6·650	**713**	6	Mr	31	·23	7	Ap	29	·76	2	My	29	·29	3	Je	27	·82	5	Jl	27	·35
3815	771	636	20M	·7187	29·40483	4·784	**714**	5	Ap	19	·13	6	My	18	·66	1	Je	17	·19	2	Jl	16	·72	4	Au	15●	·25
3816	772	637	20M	·9774	18·51327	0·941	**715**	2	Ap	8	·49	4	My	8	·02	5	Je	6	·55	7	Jl	6○	·08	1	Au	4●	·61
3817	773	638	20M	·2361	7·62171	24·653	**716**	6	Mr	27	·86	1	Ap	26	·39	2	My	25	·92	4	Je	24○	·45	7	Au	22	·51
																				5	Jl	23●	·98				
3818	774	639	20M	·4948	26·26073	22·788	**717**	5	Ap	15	·76	7	My	15	·28	1	Je	13○	·82	3	Jl	13	·35	4	Au	11	·88
3819	775	640	20M	·7535	15·36907	18·945	**718**	3	Ap	5	·12	4	My	4	·65	6	Je	3	·19	7	Jl	2	·72	2	Au	1	·25
3820	776	641	21M	·0121	4·47760	15·103	**719**	7	Mr	25	·49	2	Ap	24○	·02	3	My	23●	·55	6	Jl	21	·61	1	Au	20	·14
																5	Je	22	·08								
3821	777	642	20M	·2708	23·11662	13·237	**720**	6	Ap	12○	·39	7	My	11	·92	2	Je	10	·45	3	Jl	9	·98	5	Au	8	·51
3822	778	643	20M	·5295	12·22506	9·394	**721**	3	Ap	1	·76	5	My	1	·29	6	My	30	·82	1	Je	29	·35	2	Jl	28	·88
3823	779	644	20M	·7882	1·33350	5·552	**722**	1	Mr	22	·12	4	My	20	·18	5	Je	18	·71	7	Jl	18	·25	1	Au	16○	·78
								2	Ap	20	·65																
3824	780	645	21M	·0469	19·97251	3·686	**723**	7	Ap	10	·02	1	My	9	·55	3	Je	8	·08	4	Jl	7	·61	6	Au	6○	·14
3825	781	646	20M	·3055	9·08095	27·398	**724**	4	Mr	29	·39	5	Ap	27	·92	7	My	27	·45	1	Je	25	·98	3	Jl	25●○	·51
																								5	Au	24	·04
3826	782	647	20M	·5642	27·71998	25·532	**725**	3	Ap	17	·29	4	My	16	·82	6	Je	15	·85	7	Jl	14●	·88	2	Au	13	·41
3827	783	648	20M	·8229	16·82841	21·690	**726**	7	Ap	6	·65	2	My	6	·18	3	Je	4○	·71	5	Jl	4●	·24	6	Au	2	·77
3828	784	649	21M	·0816	5·93685	17·847	**727**	5	Mr	27	·02	6	Ap	25	·55	1	My	25●○	·08	2	Je	23	·61	5	Au	21	·67
																				4	Jl	23	·14				
3829	785	650	20M	·3403	24·57588	15·981	**728**	3	Ap	13	·92	5	My	13○	·45	6	Je	11	·98	1	Jl	11	51	3	Au	10	·04
3830	786	651	20M	·5990	13·68430	12·159	**729**	1	Ap	3○	·28	2	My	2	·81	4	Je	1	·35	5	Je	30	·88	7	Jl	30	·41
3831	787	652	20M	·8576	2·79274	8·296	**730**	5	Mr	23○	·65	7	Ap	22	·18	3	Je	20	·24	4	Jl	19	·77	6	Au	18	·30
												1	My	21	·71												
3832	788	653	21M	·1163	21·43177	6·430	**731**	4	Ap	11	·55	6	My	11	·08	7	Je	9	·61	2	Jl	9	·14	3	Au	7	·67
3833	789	654	20M	·3749	10·54020	2·588	**732**	1	Mr	30	·92	3	Ap	29	·45	4	My	28	·98	6	Je	27	·51	1	Jl	27	·04
3834	790	655	20M	·6337	29·17923	0·722	**733**	7	Ap	18	·81	2	My	18	·34	3	Je	16	·87	5	Jl	16○	·41	6	Au	14●	·94
3835	791	656	20M	·8924	18·28767	24·434	**734**	5	Ap	8	·18	6	My	7	·71	1	Je	6	·24	2	Jl	5○	·77	4	Au	4	·30
3836	792	657	21M	·1510	7·39609	20·592	**735**	2	Mr	28	·55	4	Ap	27	·08	5	My	26	·61	7	Je	25●○	·14	3	Au	23	·20
																				1	Jl	24	·67				
3837	793	658	20M	·4097	26·03512	18·725	**736**	1	Ap	15	·45	2	My	14	·98	4	Je	13	·51	6	Jl	13	·04	7	Au	11	·57
3838	794	659	20M	·6684	15·14356	14·883	**737**	5	Ap	4	·81	7	My	4○	·34	1	Je	2	·87	3	Jl	2	·40	4	Jl	31	·94
3839	795	660	20M	·9271	4·25229	11·042	**738**	3	Mr	25	·18	4	Ap	23○	·71	6	My	23	·24	2	Jl	21	·30	3	Au	19	·83
																7	Je	21	·77								
3840	796	661	21M	·1858	22·89101	9·175	**739**	2	Ap	13	·08	3	My	12	·61	5	Je	11	·14	6	Jl	10	·67	1	Au	9	·20

* For Sūrya siddhānta figures for A.D. 500 to

Ending moments of tithis are the same for Ārya and Sūrya siddhāntas

from A.D. 500 to A.D. 999 (Ārya siddhānta)*—*cont.*

	Aśvina.			Kārttika.			Mārgaśīrsha.			Pausha.		A.D.	Māgha.			A.D.	Phālguna.			Chaitra.		
	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.	
	2	Au	31	·92	4	S	30	·45	5	O	29	·98	7	N	28	·51		2	D	28	·05	
	1	S	19	·82	3	O	19	·35	4	N	17○	·88	6	D	17	·41	**90**	7	Jr	15	·94	
	6	S	9	·19	7	O	8	·72	2	N	7○	·75	3	D	6	·78	**91**	5	Jr	5	·31	
	3	Au	29	·55	5	S	28	·09	6	O	27○	·62	1	N	26	·15		2	D	25	·68	
	2	S	16	·45	4	O	15	·98	5	N	14	·51	7	D	14	·04	**93**	1	Jr	12	·57	
	6	S	5○	·82	1	O	5●	·35	2	N	3	·88	4	D	3	·41	**94**	5	Jr	1	·94	
	4	Au	26○	·19	5	S	24	·72	7	O	24	·25	1	N	22	·78		3	D	22	·31	
	3	S	14	·80	4	O	13	·61	6	N	12	·15	7	D	11	·68	**96**	2	Jr	10	·21	
	7	S	2	·45	1	O	1	·98	3	O	31	·51	5	N	30	·04		6	D	29○	·57	
	6	S	21	·35	7	O	20	·88	2	N	19	·41	3	D	18○	·94	**98**	5	Jr	17	·47	
	3	S	10	·72	5	O	10	·25	6	N	8	·78	1	D	8●○	·31	**99**	2	Jr	6	·84	
	1	Au	31	·08	2	S	29	·61	4	O	29	·14	5	N	27●	·67		7	D	27	·21	**700**
	6	S	17	·98	1	O	17○	·51	3	N	16	·04	4	D	15	·57	**01**	6	Jr	14	·11	
	4	S	7	·35	5	O	6○	·88	7	N	5	·41	1	D	4	·94	**02**	3	Jr	3	·47	
	1	Au	27	·72	3	S	26●○	·25	4	O	25	·78	6	N	24	·31		7	D	23	·84	**03**
	7	S	15	·62	2	O	15	·15	3	N	13	·68	5	D	13	·21	**04**	6	Jr	11	·74	
	4	S	3●	·99	6	O	3	·52	1	N	2	·05	2	D	1	·58		4	D	31	·11	**05**
	2	Au	24	·35																		
	3	S	22	·88	5	O	22	·42	6	N	20	·94	1	D	20	·47	**06**	3	Jr	19●○	·01	
	1	S	12	·25	2	O	11	·78	4	N	10	·31	5	D	9	·84	**07**	7	Jr	8	·37	
	5	S	1	·62	7	O	1	·15	1	O	30	·68	3	N	29○	·21		4	D	28●	·74	**08**
	4	S	19	·51	6	O	19	·05	7	N	17○	·58	2	D	17	·11	**09**	3	Jr	15	·64	
	1	S	8	·88	3	O	8	·41	4	N	6○	·94	6	D	6	·47	**10**	1	Jr	5	·00	
	6	Au	29	·25	7	S	27	·78	2	O	27●	·31	3	N	25	·84		5	D	25	·37	**11**
	5	S	17	·15	6	O	16	·68	1	N	15	·21	2	D	14	·74	**12**	4	Jr	13	·27	
	2	S	5○	·52	4	O	5●	·04	5	N	3	·57	7	D	3	·11	**13**	1	Jr	1	·64	
	6	Au	25○	·88	1	S	24	·41	2	O	23	·94	4	N	22	·47		6	D	22	·00	**14**
	5	S	13	·78	7	O	13	·31	1	N	11	·84	3	D	11	·37	**15**	4	Jr	9○	·90	
	3	S	3	·15	4	O	2	·68	6	N	1	·21	7	N	30	·74		2	D	30○	·27	**16**
	2	S	21	·04	3	O	20	·57	5	N	19	·10	6	D	18○	·63	**17**	1	Jr	17	·17	
	6	S	10	·41	7	O	9	·94	2	N	8	·47	4	D	8	·00	**18**	5	Jr	6	·53	
	3	Au	30	·78	5	S	29	·31	6	O	28○	·84	1	N	27	·37		2	D	26	·90	**19**
	2	S	18	·67	4	O	18○	·21	5	N	16	·74	7	D	16	·27	**20**	1	Jr	14	·80	
	7	S	7	·04	1	O	6○	·57	3	N	5	·10	4	D	4	·63	**21**	6	Jr	3	·16	
	4	Au	27	·41	5	S	25●	·94	7	O	25	·47	2	N	24	·00		3	D	23	·53	**22**
	3	S	15	·31	4	O	14	·84	6	N	13	·37	7	D	12	·90	**23**	2	Jr	11	·43	
	7	S	4	·67	2	O	4	·20	3	N	2	·73	5	D	2	·27		6	D	31	·80	**24**
	6	S	22	·57	1	O	22	·10	2	N	20	·63	4	D	20	·16	**25**	5	Jr	18●	·69	
	3	S	11	·94	5	O	11	·47	7	N	10	·00	1	D	9○	·53	**26**	3	Je	8●	·06	
	1	S	1	·31	2	S	30	·84	4	O	30	·37	5	N	28○	·90		7	D	28●	·43	**27**
	7	S	20	·20	1	O	19	·73	3	N	18○	·26	4	D	17	·79	**28**	6	Jr	16	·33	
	4	S	8	·57	6	O	8	·10	7	N	6●	·63	2	D	6	·16	**29**	3	Jr	4	·69	
	1	Au	28	·94	3	S	27	·47	5	O	27●	·00	6	N	25	·53		1	D	25	·06	**30**
	7	S	16○	·83	2	O	16	·37	3	N	14	·90	5	D	14	·43	**31**	6	Jr	12	·96	
	5	S	6○	·20	6	O	5	·73	1	N	4	·26	2	D	3	·79	**32**	4	Jr	2	·32	
	2	Au	25●	·57	4	S	24	·10	5	O	23	·63	7	N	22	·16		1	D	21	·69	**33**
	1	S	13	·47	3	O	13	·00	4	N	11	·53	6	D	11	·06	**34**	7	Jr	9○	·59	
	5	S	2	·33	7	O	2	·36	1	O	31	·89	3	N	30	·43		4	D	29●○	·96	**35**
	4	S	21	·73	6	O	21	·26	7	N	19	·79	2	D	19●	·33	**36**	3	Jr	17	·85	
	2	S	10	·10	3	O	9	·63	5	N	8○	·15	6	D	7	·69	**37**	1	Jr	6	·22	
	6	Au	30	·47	1	S	29	·00	2	O	28●○	·53	4	N	27	·06		5	D	26	·59	**38**
	5	S	18	·36	6	O	17○	·89	1	N	16	·42	2	D	15	·95	**39**	4	Jr	14	·49	
	2	S	7	·73	4	O	7	·26	5	N	5	·79	7	D	5	·32	**40**	1	Jr	3	·85	

89	3	Jr	26	·58	5	F	25	·11														
	2	F	14	·47	4	Mr	16	·00														
	6	F	3	·84	1	Mr	5	·37														
92	4	Jr	24	·21	5	F	22	·74														
	3	F	11	·11	4	Mr	12○	·64														
	7	Jr	31	·47	2	Mr	2○	·00														
95	4	Jr	20	·84	6	F	19●○	·37														
					7	Mr	20	·90														
	3	F	8	·74	5	Mr	9	·27														
97	1	Jr	28●	·10	2	F	26	·63														
	7	F	16	·00	1	Mr	17	·53														
	4	F	5	·37	5	Mr	6	·90														
700	1	Jr	25	74	3	F	24	·27														
	7	F	12	·64	2	Mr	14	·17														
	5	F	2	·01	6	Mr	3	·54														
03	2	Jr	22	·37	3	F	20	·90														
	1	F	10○	·27	2	Mr	10	·80														
05	5	Jr	29○	·64	7	F	28●	·17														
	4	F	17	·54	6	Mr	19	·07														
	1	F	6	·90	3	Mr	8	·43														
08	6	Jr	27	·27	7	F	25	·80														
	5	F	14	·17	6	Mr	15	·70														
	2	F	3	·53	4	Mr	5	·07														
11	6	Jr	23	·90	1	F	22	·43														
	5	F	11	·80	7	Mr	12○	·33														
	3	Jr	31	·17	4	Mr	1○	·70														
14	7	Jr	20	·53	2	F	19●	·06														
					3	Mr	20	·59														
	6	F	8	·43	7	Mr	9	·96														
16	3	Jr	28	·80	5	F	27	·33														
	2	F	15	·70	4	Mr	17	·23														
	7	F	5	·06	1	Mr	6	·59														
19	4	Jr	25	·43	5	F	23	·96														
	3	F	13	·33	4	Mr	13	·86														
	7	F	1	·69	2	Mr	3	·23														
22	5	Jr	22	·06	6	F	20○	·59														
	3	F	9○	·96	5	Mr	11	·49														
24	1	Jr	30○	·33	2	F	28	·86														
	7	F	17	·22	1	Mr	18	·75														
	4	F	6	·59	6	Mr	8	·12														
27	1	Jr	26	·96	3	F	25	·49														
	7	F	14	·86	2	Mr	15	·39														
	5	F	3	·22	6	Mr	4	·75														
30	2	Jr	28	·59	4	F	22	·12														
	1	F	11	·49	3	Mr	13○	·02														
	5	Jr	31	·85	7	Mr	1	·39														
33	3	Jr	20○	·22	4	F	18	·75														
					6	Mr	20	·28														
	2	F	8	·12	3	Mr	9	·65														
35	6	Jr	28	·49	1	F	27	·02														
	5	F	16	·38	6	Mr	16	·91														
	2	F	4	·75	4	Mr	6	·28														
38	7	Jr	25	·12	1	F	23	·65														
	6	F	13	·02	7	Mr	14	·55														
	3	F	2	·38	4	Mr	2○	·91														

A.D. 999 see pages 238 to 241 below.

For tithis by Brahma siddhānta add algebraically −·03 to the above.

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Month and day A.D.	Fraction of day.	Commencement of solar year.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaiśākha. Week-day.	Month.	Day.	Fraction.	Jyeshṭha. Week-day.	Month.	Day.	Fraction.	Āshāḍha. Week-day.	Month.	Day.	Fraction.	Śrāvaṇa. Week-day.	Month.	Day.	Fraction.	Bhādrapada. Week-day.	Month.	Day.	Fraction.
								A.D.																				
3841	797	662	20M	·4444	11·99945	5·333		740	8	Ap	1●	·44	7	Ap	30	·97	2	My	30	·51	4	Je	29	·04	5	Jl	28	·57
3842	798	663	20M	·7031	1·10788	1·490		741	3 Mr 21 / 5 Ap 20			·81 / ·34	6	My	19	·87	1	Je	18	·41	2	Jl	17	·93	4	Au	16○	·46
3843	799	664	20M	·9618	19·74691	27·179		742	2	Ap	9	·71	4	My	9	·24	5	Je	7	·77	7	Jl	7	·30	1	Au	5●○	·83
3844	800	665	21M	·2205	8·85525	23·337		743	7	Mr	30	·08	1	Ap	28	·61	3	My	28	·14	4	Je	26	·67	6 Jl 26 / 7 Au 24			·20 / ·73
3845	801	666	20M	·4792	27·49437	21·470		744	5	Ap	16	·97	7	My	16	·50	2	Je	15○	·03	3	Jl	14	·57	5	Au	13	·10
3846	802	667	20M	·7378	16·60280	17·629		745	3	Ap	6	·34	4	My	5	·87	6	Je	4○	·40	7	Jl	3	·93	2	Au	2	·46
3847	803	668	20M	·9985	5·71124	13·786		746	7	Mr	26	·71	2	Ap	25	·24	3	My	24●○	·78	5 Je 23 / 6 Jl 22			·30 / ·83	1	Au	21	·36
3848	804	669	21M	·2552	24·35026	11·920		747	6	Ap	14○	·61	1	My	14●	·14	2	Je	12	·67	4	Jl	12	·20	5	Au	10	·73
3849	805	670	20M	·5132	13·45870	8·077		748	3	Ap	2○	·97	5	My	2	·50	7	Je	1	·03	1	Je	30	·56	3	Jl	30	·09
3850	806	671	20M	·7726	2·56714	4·235		749	1	Mr	23●○	·34	2 Ap 21 / 4 My 21			·87 / ·40	5	Je	19	·93	7	Jl	19	·46	1	Au	17	·99
3851	807	672	21M	·0312	21·20615	2·389		750	7	Ap	11	·24	1	My	10	·77	3	Je	9	·30	4	Jl	8	·83	6	Au	7	·36
3852	808	673	21M	·2899	10·31459	26·081		751	4	Mr	31	·60	6	Ap	30	·13	7	My	29	·67	2	Je	28	·20	3	Jl	27○	·73
3853	809	674	20M	·5486	28·95362	24·215		752	3	Ap	18	·50	5	My	18	·03	6	Je	16	·56	1	Jl	16○	·09	2	Au	14	·62
3154	810	675	20M	·8073	18·06205	20·373		753	7	Ap	7	·87	2	My	7	·40	3	Je	5	·93	5	Jl	5○	·46	6	Au	3	·99
3855	811	676	21M	·0660	7·17049	16·530		754	5	Mr	28	·24	6	Ap	26	·77	1	My	26	·30	2 Je 24● / 4 Jl 24			·83 / ·36	5	Au	22	·89
3856	812	677	21M	·3246	25·80951	14·664		755	4	Ap	16	·13	5	My	15○	·66	7	Je	14	·19	1	Jl	13	·73	3	Au	12	·26
3857	813	678	20M	·5833	14·91795	10·822		756	1	Ap	4	·50	3	My	4○	·03	4	Je	2	·56	6	Jl	2	·09	7	Jl	31	·62
3858	814	679	20M	·8420	4·02638	6·980		757	5	Mr	24	·87	7	Ap	23●	·40	1 My 22 / 3 Je 21			·93 / ·44	4	Jl	20	·99	6	Au	19	·52
3859	815	680	21M	·1007	22·66534	5·113		758	4	Ap	12	·77	6	My	12	·30	7	Je	10	·83	2	Jl	10	·36	3	Au	8	·89
3860	816	681	21M	·3594	11·77445	1·272		759	2	Ap	2●	·13	3	My	1	·66	5	My	31	·19	6	Je	29	·72	1	Jl	29	·25
3861	817	682	20M	·6180	0·88228	24·983		760	6 Mr 21 / 1 Ap 20			·50 / ·03	2	My	19	·56	4	Je	18	·09	5	Jl	17	·62	7	Au	16○	·15
3862	818	683	20M	·8767	19·52131	23·117		761	5	Ap	9	·40	6	My	8	·93	1	Je	7	·46	2	Jl	6	·99	4	Au	5●	·52
3863	819	684	21M	·1354	8·62974	19·275		762	2	Mr	29	·77	4	Ap	28	·30	5	My	27	·83	7	Je	26○	·36	1 Jl 25 / 3 Au 24			·89 / ·42
3864	820	685	21M	·3941	27·26876	17·409		763	1	Ap	17	·67	3	My	17	·20	4	Je	15○	·73	6	Jl	15	·26	7	Au	13	·79
3865	821	686	20M	·6528	16·37720	13·566		764	6	Ap	6	·03	7	My	5	·56	2	Je	4●○	·09	3	Jl	3	·62	5	Au	2	·15
3866	822	687	20M	·9114	5·48564	9·724		765	3	Mr	26	·40	4	Ap	24○	·93	6	My	24	·46	7 Je 22 / 2 Jl 22			·99 / ·52	4	Au	21	·05
3867	823	688	21M	·1701	24·12485	7·858		766	2	Ap	14○	·30	3	My	18	·83	5	Je	12	·36	6	Jl	11	·89	1	Au	10	·42
3868	824	689	21M	·4288	13·23310	4·016		767	6	Ap	3●○	·66	1	My	3	·19	2	Je	1	·73	4	Jl	1	·26	5	Jl	30	·79
3869	825	690	20M	·6875	2·84153	0·173		768	4	Mr	23●	·02	6 Ap 21 / 7 My 21			·56 / ·09	1	Je	19	·62	3	Jl	19	·15	4	Au	17	·68
3870	826	691	20M	·9362	20·98055	25·862		769	2	Ap	10	·93	4	My	10	·46	5	Je	8	·99	7	Jl	8	·52	2	Au	7○	·05
3871	827	692	21M	·2049	10·08899	22·019		770	7	Mr	31	·30	1	Ap	29	·83	3	My	29	·36	4	Je	27	·89	2	Jl	27○	·42
3872	828	693	21M	·4635	28·72811	20·158		771	6	Ap	19	·19	7	My	18	·72	2	Je	17	·25	3	Jl	16○	·79	5	Au	15	·32
3873	829	694	20M	·7222	17·83644	16·311		772	3	Ap	7	·56	5	My	7	·09	6	Je	5	·62	1	Jl	5●	·15	2	Au	3	·68
3874	830	695	20M	·9809	6·94488	12·489		773	7	Mr	27	·93	2	Ap	26	·46	3	My	25○	·99	5 Je 24 / 7 Jl 24			·52 / ·05	1	Au	22	·58
3875	831	696	21M	·2396	25·58391	10·602		774	6	Ap	15	·83	1	My	15○	·86	2	Je	13	·89	4	Jl	13	·42	5	Au	11	·95
3876	832	697	21M	·4983	14·69234	6·760		775	4	Ap	5	·19	5	My	4●○	·72	7	Je	3	·25	1	Jl	2	·78	3	Au	1	·31
3877	833	698	20M	·7569	3·80077	2·912		776	1	Mr	24○	·56	3	Ap	23	·09	4 My 22 / 6 Je 21			·62 / ·15	7	Jl	20	·68	2	Au	19	·21
3878	834	699	21M	·0156	22·43980	1·052		777	7	Ap	12	·46	1	My	11	·99	3	Je	10	·52	5	Jl	10	·05	6	Au	8	·58
3879	835	700	21M	·2743	11·54823	24·764		778	4	Ap	1	·82	6	My	1	·35	7	My	30	·88	2	Je	29	·42	3	Jl	28	·95
3880	836	701	21M	·5330	0·65667	20·922		779	2 Mr 22 / 3 Ap 20			·19 / ·72	5	My	20	·25	6	Je	18	·78	1	Jl	18	·31	2	Au	16●	·84
3881	837	702	20M	·7917	19·29570	19·055		780	1	Ap	9	·09	2	My	8	·62	4	Je	7	·15	5	Jl	6○	·68	7	Au	5●	·21
3882	838	703	21M	·0503	8·40413	15·213		781	5	Mr	29	·46	6	Ap	27	·99	1	My	27	·52	3	Je	26●○	·05	4 Jl 25 / 6 Au 24			·58 / ·11
3883	839	704	21M	·3090	27·04315	13·347		782	4	Ap	17	·35	5	My	16	·88	7	Je	15○	·41	1	Jl	14	·95	3	Au	13	·48
3884	840	705	21M	·5677	16·15159	9·505		783	1	Ap	6	·72	3	My	6	·25	4	Je	4	·78	6	Jl	4	·31	7	Au	2	·84
3885	841	706	20M	·8264	5·26002	5·662		784	6	Mr	26	·09	7	Ap	24○	·62	2 My 24 / 3 Je 22			·15 / ·68	5	Jl	22	·21	6	Au	20	·74
3886	842	707	21M	·0851	23·89905	3·796		785	4	Ap	13○	·99	6	My	13	·52	1	Je	12	·05	2	Jl	11	·58	4	Au	10	·11
3887	843	708	21M	·3437	13·00749	27·503		786	2	Ap	3●	·35	3	My	2	·88	5	Je	1	·41	6	Je	30	·94	1	Jl	30	·47
3888	844	709	21M	·6024	2·11591	23·866		787	6	Ap	23●	·72	1 Ap 22 / 2 My 21			·25 / ·78	4	Je	20	·31	5	Jl	19	·84	7	Au	18○	·37
3889	845	710	20M	·8611	20·75494	21·800		788	5	Ap	10	·62	7	My	10	·15	1	Je	8	·68	3	Jl	8	·21	4	Au	6○	·74
3890	846	711	21M	·1198	9·86339	17·958		789	2	Mr	30	·98	4	Ap	29	·51	6	My	29	·05	7	Je	27	·58	2	Jl	27●○	·11
3891	847	712	21M	·3785	28·50240	16·091		790	1	Ap	18	·88	3	My	18	·41	4	Je	16	·94	6	Jl	16	·47	1	Au	15	·00
3892	848	713	21M	·6371	17·61084	12·249		791	6	Ap	8	·25	7	My	7	·78	2	Je	6○	·31	3	Jl	5●	·84	5	Au	4	·37
3893	849	714	20M	·8958	8·71928	8·407		792	3	Mr	27	·62	5	Ap	26	·15	6	My	25○	·68	1 Je 24 / 2 Jl 23			·21 / ·74	4	Au	22	·27
3894	850	715	21M	·1545	25·55829	6·541		793	2	Ap	15	·51	4	My	15○	·04	5	Je	13	·57	7	Jl	13	·11	1	Au	11	·64
3895	851	716	21M	·4132	14·48673	2·698		794	6	Ap	4	·88	1	My	4●	·41	2	Je	2	·94	4	Jl	2	·47	6	Au	1	·00

* For Sūrya siddhānta figures for A.D. 500
Ending moments of tithis are the same for Ārya and Sūrya siddhāntas.

from A.D. 500 to A.D. 999 (Ārya siddhānta)*—*cont.*

Āśvina.				Kārttika.				Mārgaśirsha.				Pausha.			A.D.	Māgha.				A.D	Phālguna.				Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
7	Au	27○	·10	1	S	25	·63	3	O	25	·16	4	N	23	·69	6	D	23	·22	**41**	7	Jr	21	·75	2	F	20○	·28
5	S	14	·99	7	O	14	·53	2	N	13	·06	3	D	12	·59	**42**	5	Jr	11	·12		6	F	9○	·65	1	Mr	11	·18
3	S	4	·36	4	O	3	·89	6	N	2	·42	7	D	1	·95		2	D	31	·48	**43**	4	Jr	30	·01	5	F	28	·55
2	S	23	·26	3	O	22	·79	5	N	21	·32	6	D	20○	·85	**44**	1	Jr	19	·38		2	F	17	.91	4	Mr	18	·44
6	S	11	·63	1	O	11	·16	2	N	9	·69	4	D	9○	·22	**45**	5	Jr	7	·75		7	F	6	·28	1	Mr	7	·81
3	Au	31	·99	5	S	30	·52	7	O	30	·05	1	N	28○	·59		3	D	28	·12	**46**	4	Jr	26	·65	6	F	25	·18
2	S	19	·89	4	O	19	·42	5	N	17	·95	7	D	17	·48	**47**	2	Jr	16	·01		3	F	14	·54	5	Mr	16	·07
7	S	9	·26	1	O	8	·79	3	N	7●	·32	4	D	6	·85	**48**	6	Jr	5	·38		7	F	3	·93	2	Mr	4	·44
4	Au	28	·63	6	S	27○	16	7	O	26	·69	2	N	25	·22		3	D	24	·75	**49**	5	Jr	23	·28	6	F	21	·81
3	S	16○	·52	5	O	16	·05	6	N	14	·58	1	D	14	·11	**50**	2	Jr	12	·64		4	F	11	·18	5	Mr	12	·71
7	S	5	·89	2	O	5	·42	3	N	3	·96	5	D	3	·48	**51**	7	Jr	2	·01		1	Jr	31○	·54	3	Mr	2	·07
5	Au	26	·26	6	S	24	·79	**Mārgaśirsha Kshaya**																					
				1	O	24	·32					2	N	22	·85		4	D	22	·38	**52**	5	Jr	20○	·91	7	F	19	·44
																										1	Mr	19	·97
4	S	13	·15	5	O	12	·69	7	N	11	·22	1	D	10	·75	**53**	3	Jr	9●○	·28		4	F	7	·81	6	Mr	9	·34
1	S	2	·52	3	O	2	·05	4	O	31	·58	6	N	30	·11		7	D	20●	·64	**54**	2	Jr	28	·17	3	F	28	·71
7	S	21	·42	1	O	20	·95	3	N	19○	·43	5	D	19	·01	**55**	6	Jr	17	·54		1	F	16	.07	2	Mr	17	·60
4	S	10	·79	6	O	10	·32	7	N	8○	·85	2	D	8	·38	**56**	3	Jr	6	·91		5	F	5	·44	6	Mr	5	·97
2	Au	30	·15	3	S	28	·68	5	O	28●○	21	6	N	26	·75		1	D	26	·28	**57**	2	Jr	24	·81	4	F	23	·34
1	S	18	·05	2	O	17	·58	4	N	16	·11	5	D	15	·64	**58**	7	Jr	14	·17		1	F	12	·70	3	Mr	14○	·73
5	S	7○	·42	6	O	6●	·95	1	N	5	·48	3	D	5	·01	**59**	4	Jr	3	·54		6	F	2	·07	7	Mr	3○	·60
2	Au	27○	·79	4	S	26	·32	5	O	25	·85	7	N	24	·38		1	D	23	·91	**60**	3	Jr	22	·44	4	F	20○	·97
1	S	14	·68	3	O	14	·21	4	N	12	·74	6	D	12	·27	**61**	7	Jr	10	·81		2	F	9	·34	3	Mr	10	·87
6	S	4	·05	7	O	3	·58	2	N	2	·11	3	D	1	·64		5	D	31○	·18	**62**	6	Jr	29●	·71	1	F	28	·24
4	S	22	·95	6	O	22	·48	1	N	21	·01	2	D	20○	·54	**63**	4	Jr	19●	·07		5	F	17	·60	7	Mr	19	·13
2	S	12	·32	3	O	11	·85	5	N	10	·38	6	D	9○	·91	**64**	1	Jr	8	·44		2	F	6	·97	4	Mr	7	·50
6	Au	31	·69	1	S	30	·22	2	O	29	·75	4	N	28●	·28		5	D	27	·81	**65**	7	Jr	26	·34	1	F	24	·87
5	S	19	·58	7	O	19	·11	1	N	17	·64	3	D	17	·17	**66**	4	Jr	15	·71		6	F	14	·24	7	Mr	15	·77
2	S	8	·95	4	O	8○	·48	6	N	7●	·01	7	D	6	·54	**67**	2	Jr	5	·07		3	F	3	·60	5	Mr	5	·13
7	Au	29	·32	1	S	27○	·85	3	O	27	·38	4	N	25	·91		6	D	25	·44	**68**	7	Jr	23	·97	2	F	22	·50
6	S	16	·25	7	O	15	·75	2	N	14	·28	3	D	13	·81	**69**	5	Jr	12	·34		6	F	10○	·87	1	Mr	12	·40
3	S	5●	·56	5	O	5	·11	6	N	3	·64	1	D	3	·17	**70**	2	Jr	1	·70		4	Jr	31○	·23	5	Mr	1	·77
7	Au	25●	·95	4	O	24	.01	5	N	22	·54	**Pausha Kshaya**																	
2	S	24	·48														7	D	22	·07	**71**	1	Jr	20○	·60	3	F	19	·13
																										4	Mr	20	·66
6	S	13	·85	1	O	13	·38	2	N	11	·91	4	D	11	·44	**72**	5	Jr	9	·97		7	F	8	·50	2	Mr	9	·03
4	S	2	·21	5	O	1	·74	6	O	31	·27	1	N	29○	·81		3	D	29●	·34	**73**	4	Jr	27	·87	6	F	26	·40
3	S	21	·11	5	O	20	·64	9	N	19○	·17	7	D	18	·70	**74**	2	Jr	17	·23		3	F	15	·76	5	Mr	17	·29
7	S	10	·48	2	O	10	·01	3	N	8○	·54	5	D	8	·07	**75**	6	Jr	6	·60		1	F	5	·13	2	Mr	6	·66
4	Au	30	·85	6	S	29	·38	7	O	28●	·91	2	N	27	·44		3	D	26	·97	**76**	5	Jr	25	·50	7	F	24	·03
3	S	17○	·74	5	O	17	·27	6	N	15	·60	1	D	15	·33	**77**	2	Jr	13	·87		4	F	12	·40	5	Mr	13○	·93
1	S	7○	·11	2	O	6	·64	4	N	5	·17	5	D	4	·70	**78**	7	Jr	3	·23		1	F	1	·78	3	Mr	3○	·29
5	Au	27○	·48	7	S	26	·01	1	O	25	·54	3	N	24	·07		4	D	23	·60	**79**	6	Jr	22	·13	7	F	20●	·66
4	S	15	·37	5	O	14	·91	7	N	13	·44	1	D	12	·97	**80**	3	Jr	11○	·50		5	F	10●	·03	6	Mr	10	·56
1	S	3	·74	3	O	3	·27	4	N	1	·80	6	D	1	·33		7	D	30○	·86	**81**	2	Jr	29	·39	8	F	27	·92
7	S	23	·64	2	O	22	·17	3	N	20	·70	5	D	20○	·23	**82**	6	Jr	18	·76		1	F	17	·29	2	Mr	18	·82
5	S	12	·01	6	O	11	·54	1	N	10	·07	2	D	9●	·60	**83**	4	Jr	8	·13		5	F	6	·68	7	Mr	8	·19
3	S	1	·37	3	S	30	·90	5	O	30	43	6	N	28●	·97		1	D	28	·50	**84**	3	Jr	27	·03	4	F	25	·56
1	S	19	·27	2	O	18○	·80	4	N	17	·33	5	D	16	·86	**85**	7	Jr	15	·39		1	F	13	·92	3	Mr	15	·45
5	S	8	·64	7	O	8○	·17	1	N	6	·70	3	D	6	·23	**86**	4	Jr	4	·76		6	F	3	·29	7	Mr	4	·82
3	Au	29	·01	4	S	27●	·54	6	O	27	·07	7	N	25	·60		2	D	25	·13	**87**	3	Jr	23	·66	5	F	22○	·19
1	S	16●	·90	3	O	16	·43	4	N	14	·96	6	D	14	·49	**88**	1	Jr	13	·03		2	F	11○	·56	4	Mr	12	·09
6	S	5	·27	7	O	4	·80	2	N	3	·33	3	D	2	·86	**89**	5	Jr	1	·39		6	Jr	30●○	·92	1	Mr	1	·45
3	Au	25	·64	6	O	23	·70	1	N	22	·23	2	D	21	·76	**90**	4	Jr	20●	·29		5	F	18	·82	7	Mr	20	·35
5	S	24	·17																										
2	S	13	·53	4	O	13	·07	5	N	11	·60	7	D	11○	·13	**91**	1	Jr	9●	·68		3	F	8	·19	4	Mr	9	·72
6	S	2	·90	1	O	2	·43	3	O	31	·96	4	N	30○	·49		6	D	30	·02	**92**	7	Jr	28	·55	2	F	27	·09
5	S	20	·80	7	O	20	·33	1	N	18●○	86	3	D	18	·39	**93**	4	Jr	16	·92		6	F	15	·45	7	Mr	16	·98
3	S	10	·17	4	O	9	·70	6	N	8	·23	7	D	7	·76	**94**	2	Jr	6	·29		3	F	4	·82	5	Mr	6	·35
7	Au	30	·53	2	S	29○	·06	3	O	28	·49	5	N	27	·13		6	D	26	·66	**95**	1	Jr	25	·19	2	F	23	·72

to A.D. 999 see pages 238 to 241 below.

For tithis by Brahma siddhānta add algebraically —·04 to the above.

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Commencement of solar year. Month and day A.D.	Commencement of solar year. Fraction of day.	First new moon in solar year.	Anomaly or first new moon.	Christian era.	Vaiśākha. Week-day.	Vaiśākha. Month.	Vaiśākha. Day.	Vaiśākha. Fraction.	Jyeshṭha. Week-day.	Jyeshṭha. Month.	Jyeshṭha. Day.	Jyeshṭha. Fraction.	Āshāḍha. Week-day.	Āshāḍha. Month.	Āshāḍha. Day.	Āshāḍha. Fraction.	Śrāvaṇa. Week-day.	Śrāvaṇa. Month.	Śrāvaṇa. Day.	Śrāvaṇa. Fraction.	Bhādrapada. Week-day.	Bhādrapada. Month.	Bhādrapada. Day.	Bhādrapada. Fraction.
							A.D.																				
3896	852	717	21M	·6719	3·57448	26·410	795	4	Mr	25○	·25	5	Ap	23	·78	7 / 1	My / Je	23 / 21	·31 / ·84	3	Jl	21	·37	4	Au	19	·90
3897	853	718	20M	·9305	22·21419	24·544	796	3	Ap	12	·15	4	My	11	·68	6	Je	10	·21	7	Jl	9	·74	2	Au	8	·27
3898	854	719	21M	·1892	11·32263	20·702	797	7	Ap	1	·51	2	My	1	·04	3	My	30	·57	5	Je	29	·10	6	Jl	28	·63
3899	855	720	21M	·4479	0·43106	16·860	798	4 / 6	Mr / Ap	21 / 20	·88 / ·41	7	My	19	·94	2	Je	18	·47	4	Jl	18○	·00	5	Au	16	·53
3900	856	721	21M	·7066	19·07008	14·993	799	3	Ap	9	·78	5	My	9	·31	6	Je	7	·84	1	Jl	7○	·37	2	Au	5	·90
3901	857	722	20M	·9653	8·17852	11·151	800	1	Mr	29	·15	2	Ap	27	·68	4	My	27	·21	5	Je	25●○	·74	7 / 1	Jl / Au	25 / 23	·27 / ·80
3902	858	723	21M	·2240	26·81755	9·285	801	7	Ap	17	·04	1	My	16	·57	3	Je	15●	·11	4	Jl	14	·64	6	Au	13	·17
3903	859	724	21M	·4826	15·92587	5·443	802	4	Ap	6	·41	5	My	5○	·94	7	Je	4●	·47	2	Jl	4	·00	3	Au	2	·53
3904	860	725	21M	·7413	5·03441	1·601	803	1	Mr	26	·78	3	Ap	25●○	·31	4 / 6	My / Je	24 / 23	·84 / ·37	7	Jl	22	·90	2	Au	21	·43
3905	861	726	21M	·0000	23·67344	27·289	804	7	Ap	13	·68	2	My	13	·21	3	Je	11	·74	5	Jl	11	·27	6	Au	9	·80
3906	862	727	21M	·2587	12·78187	23·447	805	5	Ap	3	·04	6	My	2	·57	1	Je	1	·10	2	Je	30	·63	4	Jl	30	·17
3907	863	728	21M	·5174	1·89031	19·604	806	2	Mr	23	·41	3 / 5	Ap / My	21 / 21	·94 / ·47	7	Je	20	·00	1	Jl	19	·53	3	An	18○	·06
3908	864	729	21M	·7760	20·52934	17·738	807	1	Ap	11	·31	2	My	10	·84	4	Je	9	·37	5	Jl	8	·90	7	Au	7○	·43
3909	865	730	21M	·0347	9·63776	13·896	808	5	Mr	30	·67	7	Ap	29	·21	1	My	28	·74	3	Je	27	·27	4	Jl	26●	·80
3910	866	731	21M	·2934	28·27679	12·030	809	4	Ap	18	·57	6	My	18	·10	7	Je	16○	·63	2	Jl	16●	·16	3	Au	14	·69
3911	867	732	21M	·5521	17·38523	8·187	810	1	Ap	7	·94	3	My	7	·47	5	Je	6○	·00	6	Jl	5	·53	1	Au	4	·06
3912	868	733	21M	·8108	6·49366	4·345	811	6	Mr	28	·31	7	Ap	26	·84	2	My	26○	·37	3 / 5	Je / Jl	24 / 24	·90 / ·43	6	Au	22	·96
3913	869	734	21M	·0694	25·13269	2·479	812	5	Ap	15	·20	6	My	14●	·73	1	Je	13	·27	2	Jl	12	·80	4	Au	11	·33
3914	870	735	21M	·3281	14·24112	26·191	813	2	Ap	4○	·57	4	My	4●	·10	5	Je	2	·63	7	Jl	2	·16	1	Jl	31	·69
3915	871	736	21M	·5868	3·34955	22·349	814	6	Mr	24●○	·94	1	Ap	23	·47	3 / 4	My / Je	23 / 21	·00 / ·53	6	Jl	21	·06	7	Au	19	·59
3916	872	737	21M	·8455	21·98858	20·483	815	5	Ap	12	·84	7	My	12	·37	1	Je	10	·90	3	Jl	10	·43	4	Au	8	·96
3917	873	738	21M	·1042	11·05702	16·640	816	3	Ap	1	·20	4	Ap	30	·73	6	My	30	·26	7	Je	28	·79	2	Jl	28	·33
3918	874	739	21M	·3628	0·20545	12·799	817	7 / 2	Mr / Ap	21 / 20	·57 / ·10	3	My	19	·63	5	Je	18	·16	6	Jl	17○	·69	1	Au	16	·22
3919	875	740	21M	·6215	18·84448	10·932	818	6	Ap	9	·47	1	My	9	·00	2	Je	7	·53	4	Jl	7●○	·06	5	Au	5	·59
3920	876	741	21M	·8802	7·95291	7·089	819	3	Mr	29	·83	5	Ap	28	·37	6	My	27	·90	1	Je	26●	·43	2 / 4	Jl / Au	25 / 24	·96 / ·49
3921	877	742	21M	·1389	26·59193	5·223	820	2	Ap	16	·73	4	My	16○	·26	5	Je	14	·79	7	Jl	14	·32	1	Au	12	·85
3922	878	743	21M	·3976	15·70037	1·381	821	7	Ap	6	·10	1	My	5●○	·63	3	Je	4	·16	4	Jl	3	·69	6	Au	2	·22
3923	879	744	21M	·6562	4·81881	25·103	822	4	Mr	26	·47	8	Ap	25●	·00	7 / 2	My / Je	24 / 23	·53 / ·06	3	Jl	22	·59	5	Au	21	·12
3924	880	745	21M	·9149	23·44782	23·227	823	3	Ap	14	·36	4	My	13	·89	6	Je	12	·43	7	Jl	11	·96	2	Au	10	·49
3925	881	746	21M	·1736	12·55626	19·385	824	7	Ap	2	·73	2	My	2	·26	3	My	31	·79	5	Je	30	·32	6	Jl	29	·85
3926	882	747	21M	·4323	1·66470	15·543	825	5	Mr	28	·10	6 / 1	Ap / My	21 / 21	·63 / ·16	2	Je	19	·69	4	Jl	19	·22	5	An	17○	·75
3927	883	748	21M	·6910	20·30372	13·676	826	4	Ap	11	·00	5	My	10	·53	7	Je	9	·06	1	Jl	8	·59	3	Au	7●	·12
3928	884	749	21M	·9496	9·41246	9·834	827	1	Mr	31	·36	2	Ap	29	·89	4	My	29	·42	5	Je	27○	·95	7	Jl	27	·49
3929	885	750	21M	·2083	28·05119	7·968	828	7	Ap	18	·26	1	My	17	·79	3	Je	16○	·32	4	Jl	15	·85	6	Au	14	·38
3930	886	751	21M	·4670	17·15961	4·126	829	4	Ap	7	·63	6	My	7	·16	7	Je	5●○	·69	2	Jl	5	·22	3	Au	3	·75
3931	887	752	21M	·7257	6·26805	0·283	830	1	Mr	27	·99	3	Ap	26	·53	5	My	26	·06	6 / 1	Je / Jl	24 / 24	·59 / ·12	2	Au	22	·65
3932	888	753	21M	·9844	24·90708	25·971	831	7	Ap	15○	·89	2	My	15●	·42	3	Je	13	·95	5	Jl	13	·48	7	Au	12	·01
3933	889	754	21M	·2431	14·01551	22·129	832	5	Ap	4○	·26	6	My	3	·79	1	Je	2	·32	2	Jl	1	·85	4	Jl	31	·38
3934	890	755	21M	·5017	3·12395	18·287	833	2	Mr	24●○	·63	4	Ap	23	·16	5 / 7	My / Je	22 / 21	·69 / ·22	1	Jl	20	·75	3	Au	19	·28
3935	891	756	21M	·7604	21·76298	16·421	834	1	Ap	12	·52	3	My	12	·05	4	Je	10	·59	6	Jl	10	·12	7	Au	8	·65
3936	892	757	22M	·0191	10·87140	12·579	835	5	Ap	1	·89	7	My	1	·42	2	My	30	·95	3	Je	29	·48	5	Jl	29○	·01
3937	893	758	21M	·2778	29·51043	8·736	836	4	Ap	19	·79	6	My	19	·32	7	Je	17	·85	2	Jl	17●○	·38	3	Au	15	·91
3938	894	759	21M	·5365	18·61887	6·870	837	2	Ap	9	·16	3	My	8	·69	5	Je	7	·22	6	Jl	6	·75	1	Au	5	·28
3939	895	760	21M	7951	7·72760	3·028	838	6	Mr	29	·52	1	Ap	28	·05	2	My	27○	·58	4 / 5	Je / Jl	26 / 25	·11 / ·65	7	Au	24	·18
3940	896	761	22M	·0538	28·36632	1·161	839	5	Ap	17	·42	6	My	16○	·95	1	Je	15	·48	3	Jl	15	·01	4	Au	13	·54
3941	897	762	21M	·3125	15·47476	24·874	840	2	Ap	5	·79	4	My	5●○	·32	5	Je	3	·85	7	Jl	3	·38	1	Au	1	·91
3942	898	763	21M	·5712	4·58319	21·032	841	7	Mr	26	·15	1	Ap	24●	·69	3 / 4	My / Je	24 / 22	·22 / ·75	6	Jl	22	·28	7	Au	20	·81
3943	899	764	21M	·8289	23·22222	19·176	842	6	Ap	14	·05	7	My	13	·58	2	Je	12	·11	3	Jl	11	·64	5	Au	10	·17
3944	900	765	22M	·0885	12·32006	15·323	843	3	Ap	3	·42	4	My	2	·95	6	Je	1	·48	1	Jl	1	·01	2	Jl	30	·54
3945	901	766	21M	·3472	1·43909	11·481	844	7	Mr	22	·79	2 / 3	Ap / My	21 / 20	·32 / ·85	5	Je	19	·38	6	Jl	18	·91	1	Au	17	·44
3946	902	767	21M	·6059	20·07811	9·615	845	6	Ap	10	·68	1	My	10	·21	2	Je	8	·75	4	Jl	8○	·28	5	Au	6●	·81
3947	903	768	21M	·8646	9·18055	5·773	846	4	Mr	31	·05	6	Ap	29	·58	7	My	29	.11	1	Je	27○	·64	3	Jl	27	·17
3948	904	769	22M	·1233	27·82557	3·906	847	2	Ap	18	·95	4	My	18	·48	6	Je	17○	·01	7	Jl	16	·54	2	Au	15	·07
3949	905	770	21M	·3819	16·93401	0·064	848	7	Ap	7	·32	1	My	6	·85	3	Je	5●	·38	4	Jl	4	·91	6	Au	3	·44

* For Sūrya siddhānta figures for A.D. 500 to
Ending moments of tithis are the same for Ārya and Sūrya siddhāntas.

TABLE II.—NEW MOONS AND ECLIPSES

from A.D. 500 to A.D. 999 (Ārya siddhānta)[a]—*cont.*

Āśvina.				Kārttika.				Mārgaśīrsha.				Pausha.				A.D.	Māgha.			A.D.	Phālguna.			Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.		Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
6	S	18○	·43	7	O	17	·96	2	N	16	·50	4	D	16	·02	**96**	5	Jr	14	·55								
																	7	F	13	·08	1	Mr	13○	·61				
3	S	6●○	·80	5	O	6	·33	6	N	4	·86	1	D	4	·39	**97**	2	Jr	2	·92								
																	4	F	1	·45	5	Mr	2	·98				
1	Au	27	·17	2	S	25	·70	4	O	25	·23	5	N	23	·76		7	D	23	·29	**98**	1	Jr	21○	·82	3	F	20	·35
																	7	F	9	·72	2	Mr	11	·25				
7	S	15	·06	1	O	14	·59	3	N	13	·12	4	D	12	·65	**99**	6	Jr	11○	·19								
4	S	4	·43	5	O	3	·96	7	N	2	·49	2	D	2	·02		3	D	31○	·55	**800**	5	Jr	30	·08	6	F	28	·61
																	3	F	16	·98		5	Mr	18	·51				
3	S	22	·82	4	O	21	·86	6	N	20	·39	7	D	19	·92	**01**	2	Jr	18	·45								
																	1	F	6	·35	2	Mr	7	·88				
7	S	11	·70	2	O	11	·23	3	N	9	·76	5	D	9	·29	**02**	6	Jr	7	·82								
5	S	1	·06	6	S	30	·59	1	O	30○	·18	2	N	28●	·66		4	D	28	·19	**03**	5	Jr	26	·72	7	F	25	·25
																	4	F	14	·61		6	Mr	15	·15				
3	S	19	·96	5	O	19○	·49	7	N	18	·02	1	D	17	·55	**04**	3	Jr	16	·09								
																	1	F	2	·98	3	Mr	4	·51				
1	S	8	·33	2	O	7	·86	4	N	6	·39	5	D	5	·92	**05**	7	Jr	4	·45								
5	Au	28○	·70	7	S	27	·23	1	O	26	·76	3	N	25	·29		4	D	24	·82	**06**	6	Jr	23	·35	1	F	21○	·96
4	S	16●	·59	6	O	16	·12	7	N	14	·65	2	D	14	·19	**07**	3	Jr	12	·72		5	F	11●○	·25	6	Mr	12	·78
																	2	Jr	31●	·61		4	Mr	1	·14				
1	S	5	·96	3	O	5	·49	5	N	4	·02	6	D	3	·55	**08**	1	Jr	2	·08								
6	Au	25	·32	2	O	23	·39	3	N	21	·92	5	D	21○	·45	**09**	6	Jr	19	·98		1	F	18	·51	3	Mr	20	·04
7	S	23	·86																										
																	5	F	7	·88		7	Mr	9	·41				
5	S	13	·23	6	O	12	·76	1	N	11	·29	2	D	10○	·82	**10**	4	Jr	9	·35								
2	S	2	·59	4	O	2	·12	5	O	31	·65	7	N	30●○	·18		1	D	29	·71	**11**	3	Jr	28	·25	4	F	26	·78
																	2	F	16	·14		3	Mr	16	·67				
1	S	21	·49	3	O	21	·02	4	N	19	·55	6	D	19	·08	**12**	7	Jr	17	·61								
																	6	F	4	·51		1	Mr	6	·04				
5	S	9	·86	7	O	9○	·39	1	N	7●	·92	3	D	7	·45	**13**	4	Jr	5	·98								
3	Au	30	·22	4	S	28○	·75	6	O	28	·29	7	N	26	·82		2	D	26	·35	**14**	3	Jr	24	·88	5	F	23	·41
																	2	F	12	·77		4	Mr	14	·31				
2	S	18○	·12	3	O	17	·65	5	N	16	·18	6	D	15	·71	**15**	1	Jr	14	·24								
																	7	F	2○	·14		1	Mr	2●	·67				
6	S	7●	·49	1	O	7	·02	2	N	5	·55	4	D	5	·08	**16**	5	Jr	3	·61								
3	Au	26	·86	5	S	25	·39	6	O	24	·92	1	N	23	·45		2	D	22	·98	**17**	4	Jr	21○	·51	6	F	20●	·04
																	3	F	9	·41		4	Mr	10	·94				
2	S	14	·75	4	O	14	·28	5	N	12	·81	7	D	12	·85	**18**	1	Jr	10○	·88								
																	6	D	31	·24	**19**	7	Jr	29	·77	2	F	28	·30
7	S	4	·12	1	O	3	·65	3	N	2	·18	4	D	1	·71														
																	6	F	17	·67		1	Mr	18	·20				
6	S	23	·02	7	O	22	·55	2	N	21	·08	3	D	20	·61	**20**	5	Jr	19	·14								
																	4	F	6	·04		5	Mr	7	·57				
3	S	11	·39	4	O	10	·92	6	N	9○	·45	7	D	8●	·98	**21**	2	Jr	7	·51								
7	Au	31	·75	2	S	30	·28	3	O	29○	·81	5	N	28	·34		6	D	27	·87	**22**	1	Jr	26	·41	2	F	24	·94
																	7	F	14	·30		1	Mr	15	·83				
6	S	19	·65	1	O	19○	·18	2	N	17	·71	4	D	17	·24	**23**	5	Jr	15	·27								
																	4	F	3	·67		6	Mr	4○	·20				
4	S	9○	·02	5	O	8●	·55	7	N	7	·08	1	D	6	·61	**24**	3	Jr	5	·14								
1	Au	28○	·88	2	S	26●	·91	4	O	26	·45	5	N	24	·98		7	D	24	·51	**25**	2	Jr	23	·04	3	F	21○	·57
																	7	F	10	·93		2	Mr	12	·47				
7	S	16	·28	1	O	15	·81	3	N	14	·34	4	D	13	·87	**26**	6	Jr	12	·40								
																	5	Jr	31	·30		6	Mr	1	·83				
4	S	5	65	6	O	5	·18	7	N	3	·71	2	D	3	·24	**27**	3	Jr	1○	·77								
2	Au	26	·02	5	O	24	·08	6	N	22	·61	1	D	22○	·14	**28**	2	Jr	20	·67		4	F	19	·20	5	Mr	19	·73
3	S	24	·55																										
																	1	F	7	·57		3	Mr	9	·10				
1	S	12	·91	2	O	12	·44	4	N	10	·97	5	D	10○	·51	**29**	7	Jr	9	·04								
5	S	2	·28	6	O	1	·81	1	O	31	·34	2	N	29●	·87		4	D	29	·40	**30**	5	Jr	27	·93	7	F	26	·46
4	S	21	·81	5	O	20○	·71	7	N	19	·24	1	D	18	·77	**31**	3	Jr	17	·30		5	F	15	·83	6	Mr	17	·36
																	2	F	5	·20		3	Mr	5	·73				
1	S	10	·55	3	O	10○	·08	4	N	8	·61	6	D	8	·14	**32**	7	Jr	6	·67								
5	Au	29	·91	7	S	28○	·44	1	O	27	·97	3	N	26	·50		5	D	26	·03	**33**	6	Jr	24	·57	1	F	23	·10
																	5	F	12○	·46		6	Mr	13●	·99				
4	S	17●	·81	6	O	17	·34	7	N	15	·87	2	D	15	·40	**34**	3	Jr	13	·93								
																	2	F	1○	·83		4	Mr	3●	36				
2	S	7●	·18	3	O	6	·71	5	N	5	·24	6	D	4	·77	**35**	1	Jr	3	·30								
																					36	7	Jr	22○	·20	1	F	20	·73
6	Au	27	·54	1	S	26	·07	2	O	25	·61	4	N	24	·14		5	D	23	·67						3	Mr	21	·26
																	6	F	9	·09		7	Mr	10	·63				
5	S	14	·44	6	O	13	·97	1	N	12	·50	3	D	12	·03	**37**	4	Jr	10	·56								
2	S	3	·83	4	O	3	·34	5	N	1	·87	7	D	1	·40		1	D	30●	·93	**38**	3	Jr	29	·46	4	F	27	·99
																	2	F	17	·36		3	Mr	18	·89				
1	S	22	·71	3	O	22	·24	4	N	20○	·77	6	D	20	·30	**39**	7	Jr	18	·83								
																	6	F	8	·73		1	Mr	7	·26				
6	S	12	·07	7	O	11	·60	2	N	10○	·13	3	D	9	·67	**40**	5	Jr	8	·20								
3	Au	31	·44	4	S	29	·97	6	O	29●○	50	1	N	28	·03		2	D	27	·56	**41**	4	Jr	26	·09	5	F	24	·62
																	2	F	13	·99		4	Mr	15○	·52				
2	S	19	·34	3	O	18●	·87	5	N	17	·40	6	D	16	·93	**42**	1	Jr	15	·46								
																	7	F	3	·36		1	Mr	4●○	·89				
6	S	8○	·71	1	O	8	·24	2	N	6	·77	4	D	6	·30	**43**	5	Jr	4	·83								
4	Au	29●○	·07	5	S	27	·60	7	O	27	·13	1	N	25	·66		3	D	25	·19	**44**	4	Jr	23	·73	6	F	22●	·26
																	3	F	10●	·62		5	Mr	12	·15				
2	S	15	·97	4	O	15	·50	6	N	14	·03	7	D	13	·56	**45**	2	Jr	12○	·09								
																	7	Jr	30	·99		2	Mr	1	·52				
7	S	5	·34	1	O	4	·87	3	N	3	·40	4	D	2	·93	**46**	6	Jr	1○	·46								
4	Au	25	·70	7	O	23	·77	2	N	22	·30	3	D	21●○	·83	**47**	5	Jr	20	·36		6	F	18	·89	1	Mr	20	·42
6	S	24	·23																										
																	4	F	8	·25		5	Mr	8	·79				
3	S	13	·60	5	O	13	·13	6	N	11	·86	1	D	11	·19	**48**	2	Jr	9	·72								
7	S	1	·97	2	O	1	·50	4	O	31○	·03	5	N	29	·56		7	D	29	·09	**49**	1	Jr	27	·62	3	F	26	·15

A.D. 999 see pages 238 to 241 below.

For tithis by Brahma siddhānta add algebraically — ·04 to the above.

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Commencement of solar year. Month and day A.D.	Commencement of solar year. Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaiśākha. Week-day.	Vaiśākha. Month.	Vaiśākha. Day.	Vaiśākha. Fraction.	Jyeshṭha. Week-day.	Jyeshṭha. Month.	Jyeshṭha. Day.	Jyeshṭha. Fraction.	Āśhāḍha. Week-day.	Āśhāḍha. Month.	Āśhāḍha. Day.	Āśhāḍha. Fraction.	Śrāvaṇa. Week-day.	Śrāvaṇa. Month.	Śrāvaṇa. Day.	Śrāvaṇa. Fraction.	Bhādrapada. Week-day.	Bhādrapada. Month.	Bhādrapada. Day.	Bhādrapada. Fraction.
							A.D.																				
3950	906	771	21M	·6406	6·04245	23·776	**849**	4	Mr	27	·68	6	Ap	26○	·21	7	My	25	·74	2	Je	24	·27	5	Au	22	·34
																				3	Jl	23	·81				
3951	907	772	21M	·8923	24·68146	21·910	**850**	3	Ap	15○	·58	5	My	15	·11	6	Je	13	·64	1	Jl	13	·17	2	Au	11	·70
3952	908	773	22M	·1580	13·78990	18·068	**851**	7	Ap	4●○	·95	2	My	4	·48	4	Je	3	·01	5	Jl	2	·54	7	Au	1	·07
3953	909	774	21M	·4167	2·89834	14·226	**852**	5	Mr	24	·31	6	Ap	22	·85	1	My	22	·38	4	Jl	20	·44	5	Au	18	·97
																2	Je	20	·91								
3954	910	775	21M	·6753	21·53736	12·359	**853**	4	Ap	12	·21	5	My	11	·74	7	Je	10	·27	1	Jl	9	·80	3	Au	8○	·33
3955	911	776	21M	·9340	10·64580	8·517	**854**	1	Ap	1	·58	3	My	1	·11	4	My	30	·64	6	Je	29	·17	7	Jl	28○	·70
3956	912	777	22M	·1927	29·28482	6·651	**855**	7	Ap	20	·48	2	My	20	·01	3	Je	18	·54	5	Jl	18	·07	6	Au	16	·60
3957	913	778	21M	·4514	18·39326	2·809	**856**	4	Ap	8	·64	6	My	8	·37	7	Je	6○	·91	2	Jl	6●	·44	3	Au	4	·97
3958	914	779	21M	·7101	7·50169	26·521	**857**	3	Mr	29	·21	3	Ap	27	·74	5	My	27○	·27	6	Je	25	·80	2	Au	23	·86
																				1	Jl	25	·33				
3959	915	780	21M	·9687	26·14085	24·655	**858**	1	Ap	17	·11	2	My	16○	·64	4	Je	15	·17	5	Jl	14	·70	7	Au	13	·23
3960	916	781	22M	·2274	15·24976	20·813	**859**	5	Ap	6	·48	7	My	6●	·01	1	Je	4	·54	3	Jl	4	·07	4	Au	2	·60
3961	917	782	21M	·4861	4·35759	16·970	**860**	2	Mr	25○	·84	4	Ap	24	·37	5	My	23	·90	1	Jl	21	·97	3	Au	20	·50
																7	Je	22	·43								
3962	918	783	21M	·7448	22·99602	15·104	**861**	1	Ap	13	·74	3	My	13	·27	4	Je	11	·80	6	Jl	11	·33	7	Au	9	·86
3963	919	784	22M	·0035	12·10605	11·262	**862**	8	Ap	3	·11	7	My	2	·64	2	Je	1	·17	3	Je	30	·70	5	Jl	30	·23
3964	920	785	22M	·2621	1·21348	7·416	**863**	3	Mr	28	·47	6	My	21	·54	1	Je	20	·85	2	Jl	19○	·60	4	Au	18●	·13
								5	Ap	22	·01																
3965	921	786	21M	·5208	19·85251	5·553	**864**	2	Ap	10	·37	3	My	9	·90	5	Je	8	·43	6	Jl	7○	·96	1	Au	6●	·49
3966	922	787	21M	·7795	8·96095	1·711	**865**	6	Mr	30	·74	1	Ap	29	·27	2	My	28	·80	4	Je	27○	·33	5	Jl	26	·86
																								7	Au	25	·39
3967	923	788	22M	·0382	27·59996	27·399	**866**	5	Ap	18	·64	7	My	18	·17	1	Je	16●	·70	3	Jl	16	·23	4	Au	14	·76
3968	924	789	22M	·2969	16·70841	23·557	**867**	3	Ap	8	·00	4	My	7○	·53	6	Je	6●	·07	7	Jl	5	·60	2	Au	4	·13
3969	925	790	21M	·5556	5·81684	19·715	**868**	7	Mr	27	·37	1	Ap	25○	·90	3	My	25	·43	4	Je	23	·96	1	Au	22	·02
																				6	Jl	23	·49				
3970	926	791	21M	·8142	24·45556	17·848	**869**	6	Ap	15○	·27	7	My	14	·80	2	Je	13	·33	3	Jl	12	·86	5	Au	11	·39
3971	927	792	22M	·0729	13·56430	14·008	**870**	3	Ap	4	·64	5	My	4	·17	6	Je	2	·70	1	Jl	2	·23	2	Jl	31	·76
3972	928	793	22M	·3316	2·67283	10·164	**871**	1	Mr	25	·00	2	Ap	23	·53	5	Je	21	·59	7	Jl	21	·12	1	Au	19○	·66
												4	My	23	·06												
3973	929	794	21M	·5903	21·31175	8·298	**872**	6	Ap	11	·90	1	My	11	·43	2	Je	9	·96	4	Jl	9	·49	6	Au	8○	·09
3974	930	795	21M	·8490	10·42019	4·455	**873**	4	Ap	1	27	5	Ap	30	·80	7	My	30	·33	1	Je	28	·86	3	Jl	28●	·32
3975	931	796	22M	·1076	29·05922	2·589	**874**	3	Ap	20	·16	4	My	19	·70	6	Je	18○	·23	7	Jl	17●	·76	2	Au	16	·29
3976	932	797	22M	·3663	18·16765	26·301	**875**	7	Ap	9	·53	2	My	9	·06	3	Je	7○	·59	5	Jl	7	·12	6	Au	5	·65
3977	933	798	21M	·6250	7·27608	22·459	**876**	4	Mr	28	·90	6	Ap	27	·43	7	My	26●○	·96	2	Je	25	·49	5	Au	23	·55
																				4	Jl	25	·02				
3978	934	799	21M	·8937	25·91511	20·593	**877**	3	Ap	16	·80	5	My	16	·32	6	Je	14	·86	1	Jl	14	·39	2	Au	12	·92
3979	935	800	22M	·1424	15·02354	16·751	**878**	1	Ap	6○	·16	2	My	5●	·69	4	Je	4	·22	5	Jl	3	·76	7	Au	2	·29
3980	936	801	22M	·4009	4·13198	12·908	**879**	5	Mr	26○	·53	7	Ap	25	·06	1	My	24	·59	4	Jl	22	·65	3	Au	21	·18
																3	Je	23	·12								
3981	937	802	21M	·6597	22·77101	11·042	**880**	4	Ap	13	·43	5	My	12	·96	7	Je	11	·49	2	Jl	11	·02	3	Au	9	·55
3982	938	803	21M	·9184	11·87944	7·200	**881**	1	Ap	2	·80	3	My	2	·33	4	My	31	·86	6	Je	30	·39	7	Jl	29○	·92
3983	939	804	22M	·1771	0·98787	3·358	**382**	6	Mr	23	·16	2	My	21	·22	3	Je	19	·75	5	Jl	19○	·28	6	Au	17	·82
								7	Ap	21	·69																
3984	940	805	22M	·4359	19·62690	1·491	**883**	5	Ap	11	·06	6	My	10	·59	1	Je	9	·12	2	Jl	8●○	·65	4	Au	7	·18
3985	941	806	21M	·8044	8·73533	25·204	**884**	2	Mr	30	·43	3	Ap	28	·96	5	My	28	·49	7	Je	27	·05	1	Jl	26	·55
																								3	Au	25	·08
3986	942	807	21M	·9531	27·37436	23·337	**885**	1	Ap	18	·32	2	My	17○	·86	4	Je	16●	·39	5	Jl	15	·92	7	Au	14	·45
3987	943	808	22M	·2118	16·48280	19·495	**886**	5	Ap	7	·69	7	My	7○	·22	1	Je	5	·75	3	Jl	5	·28	4	Au	3	·81
3988	944	809	22M	·4705	5·59122	15·653	**887**	3	Mr	28	·06	4	Ap	26○	·59	6	My	26	·12	7	Je	24	·65	3	Au	22	·71
																				2	Jl	24	·18				
3989	945	810	21M	·7292	24·23025	13·787	**888**	1	Ap	14●	·96	3	My	14	·49	5	Je	13	·02	6	Jl	12	·55	1	Au	11	·08
3990	946	811	21M	·9878	13·33869	9·944	**889**	6	Ap	4●	·32	7	My	3	·85	2	Je	2	·38	3	Jl	1	·92	5	Jl	31	·45
3991	947	812	22M	·2465	2·44712	6·102	**890**	3	Mr	24	·69	5	Ap	23	·22	1	Je	21	·28	2	Jl	20	·81	4	Au	19●○	·34
												6	My	22	·75												
3992	948	813	22M	·5052	21·08615	4·236	**891**	2	Ap	12	·59	4	My	12	·12	5	Je	10	·65	7	Jl	10	·18	1	Au	8●○	71
3993	949	814	21M	·7639	10·19459	0·394	**892**	6	Mr	31	·96	1	Ap	30	·49	3	My	30	·02	4	Je	28○	·55	6	Jl	28	·08
3994	950	815	22M	·0226	28·83300	26·082	**893**	5	Ap	19	·85	7	My	19	·38	1	Je	17○	·91	3	Jl	17	·44	4	Au	15	·98
3995	951	816	22M	·2812	17·94204	22·240	**894**	3	Ap	9	·22	4	My	8	·75	6	Je	7●○	·28	7	Jl	6	·81	2	Au	5	·34
3996	952	817	22M	·5399	7·04979	18·397	**895**	7	Mr	29	·59	2	Ap	28	·12	3	My	27●	·65	5	Je	26	·18	1	Au	24	·24
																				6	Jl	25	·71				
3997	953	818	21M	·7986	25·68950	16·531	**896**	6	Ap	16○	·48	1	My	16	·02	2	Je	14	·55	4	Jl	14	·08	5	Au	12	·61
3998	954	819	22M	·0673	14·79794	12·689	**897**	3	Ap	5●○	·85	5	My	5	·38	6	Je	3	·91	1	Jl	3	·44	2	Au	1	·97
3999	955	820	22M	·3160	3·90687	8·846	**898**	1	Mr	26●○	·22	2	Ap	24	·75	4	My	24	·28	7	Jl	22	·34	1	Au	20	·87
																5	Je	22	·81								
4000	956	821	22M	·5746	22·54539	6·980	**899**	7	Ap	14	·12	1	My	13	·65	3	Je	12	·18	4	Jl	11	·71	6	Au	10○	·24
4001	957	822	21M	·8333	11·65384	3·138	**900**	4	Ap	2	·49	6	My	2	·02	7	My	31	·55	2	Je	30	·08	3	Jl	29○	·61
4002	958	823	22M	·0920	0·76328	26·850	**901**	1	Mr	22	·86	4	My	20	·92	6	Je	19	·45	7	Jl	18○	·98	2	Au	17	·51
								3	Ap	21	·39																
4003	959	824	22M	·3507	19·40129	24·984	**902**	7	Ap	10	·75	2	My	10	·28	3	Je	8	·82	5	Jl	8●	·35	6	Au	6	·88

* For Sūrya siddhānta figures for A.D 500 to
Ending moments of tithis are the same for Ārya and Sūrya siddhāntas.

from A.D. 500 to A.D. 999 (Ārya siddhānta)*—*cont.*

	Aśvina.			Kārttika.			Mārgaśīrsha.			Pausha.		A.D.	Māgha.			A.D.	Phālguna.			Chaitra.		
	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.
	6	S	20	·87	1	O	20○	·40	2	N	18	·93	4	D	18	·46	**50**	5	Jr	16	·99	
																		7	F	15	·52	2 Mr 17 ·05
	4	S	10	·23	5	O	9●○	·76	7	N	8	·29	1	D	7	·83	**51**	3	Jr	6	·36	
	1	Au	30	·60	3	S	29	·13	4	O	28	·66	6	N	27	·19		7	D	26	·72	4 F 4 ·89 6 Mr 6 ·42
	7	S	17	·50	2	O	17	·03	3	N	15	·56	5	D	15	·09	**53**	6	Jr	13	·62	**52** 2 Jr 25 ·25 3 F 23○ ·78
																		1	F	12○	·15	2 Mr 13 ·68
	4	S	6●	·87	6	O	6	·40	7	N	4	·93	2	D	4	·46	**54**	3	Jr	2	·99	
	2	Au	27	·23	3	S	25	·76	5	O	25	·29	6	N	23	·82		1	D	23	·35	5 F 1●○ ·52 7 Mr 3 ·05
	1	S	15	·13	2	O	14	·66	4	N	13	·19	5	D	12	·72	**56**	7	Jr	11	·25	**55** 2 Jr 21 ·89 {4 F 20 ·42 / 5 Mr 21 ·95}
	5	S	3	·50	7	O	3	·03	1	N	1	·56	3	D	1○	·09		4	D	30●	·62	1 F 9 ·78 3 Mr 10 ·31
	4	S	22	·39	5	O	21	·93	7	N	20○	·46	1	D	19	·99	**57**	6	Jr	29	·18	7 F 27 ·68
																	58	3	Jr	18	·52	
																		5	F	17	·05	6 Mr 18 ·58
	1	S	11	·76	3	O	11	·29	4	N	9○	·82	6	D	9	·35	**59**	7	Jr	7	·88	
	6	S	1	·13	7	S	30	·66	2	O	30	·19	3	N	28	·72		5	D	28	·25	2 F 6 ·41 3 Mr 7 ·95
	5	S	19○	·03	6	O	18●	·56	1	N	17	·09	2	D	16	·62	**61**	4	Jr	15	·15	**60** 6 Jr 26 ·78 1 F 25 ·31
																		5	F	13	·68	7 Mr 15●○ ·21
	2	S	8○	·39	3	O	7	·92	5	N	6	·45	6	D	5	·99	**62**	1	Jr	4	·52	
	6	Au	28●	·76	1	S	27	·29	2	O	26	·82	4	N	25	·35		5	D	24	·88	3 F 3 ·05 4 Mr 4● ·53
	5	S	16	·66	7	O	16	·19	1	N	14	·72	3	D	14	·25	**63**	7	Jr	23○	·41	1 F 21 ·94
	3	S	5	·03	4	O	4	·56	6	N	3	·09	7	D	2	·62	**64**	4	Jr	12○	·78	
																		6	F	11	·31	7 Mr 11 ·84
	1	S	23	·92	3	O	23	·45	4	N	21	·98	6	D	21	·51	**65**	2	Jr	1○	·15	
																	66	1	Jr	20	·05	3 Jr 30 ·68 5 Mr 1 ·21
	6	S	13	·29	7	O	12	·82	2	N	11○	·35	3	D	10●	·88						2 F 18 ·58 4 Mr 20 ·11
	3	S	2	·66	5	O	2	·19	6	O	31○	·72	1	N	30	·25	**67**	5	Jr	9	·41	
																		2	D	29	·78	6 F 7 ·94 1 Mr 9 ·47
	2	S	20	·55	4	O	20○	·09	5	N	18	·62	7	D	18	·15	**68**	4	Jr	28	·31	5 F 26 ·84
	6	S	9	·92	1	O	9●	·45	2	N	7	·98	4	D	7	·51	**69**	1	Jr	16	·68	
																						3 F 15 ·21 4 Mr 16 ·74
	4	Au	30	·29	5	S	28	·82	7	O	28	·35	1	N	26	·88	**70**	6	Jr	6	·04	
																		3	D	26	·41	7 F 4 ·57 2 Mr 6○ ·11
	3	S	18	·19	4	O	17	·72	6	N	16	·25	7	D	15	·78	**71**	4	Jr	24	·94	6 F 23○ ·47
	7	S	6	·55	2	O	6	·08	3	N	4	·61	5	D	4	·14	**72**	2	Jr	14	·31	
																		3	F	12○	·84	5 Mr 13 ·37
	4	Au	26	·92	6	S	25	·45	7	O	24	·98	2	N	23	·51	**73**	6	Jr	2	·68	
																		1	F	1●	·21	2 Mr 2 ·74
	3	S	14	·82	5	O	14	·35	6	N	12	·89	1	D	12○	·41		4	D	23	·04	
	1	S	4	·19	2	O	3	·72	4	N	2	·25	5	D	1○	·78	**74**	5	Jr	21	·57	{7 F 20 ·10 / 1 Mr 21 ·63}
																	75	2	Jr	10	·94	
	7	S	22	·08	1	O	21	·61	3	N	20○	·14	4	D	19	·67		7	D	31	·31	4 F 9 ·47 6 Mr 11 ·00
																	76	1	Jr	29	·84	3 F 28 ·37
	4	S	11	·45	5	O	10	·98	7	N	9●	·51	2	D	9	·04	**77**	6	Jr	18	·20	
																						7 F 16 ·74 2 Mr 18 ·27
	1	Au	31	·82	3	S	30○	·35	4	O	29	·88	6	N	28	·41	**78**	3	Jr	7	·57	
																		7	D	27	·94	5 F 6 ·10 6 Mr 7 ·63
	7	S	19○	·71	2	O	19	·24	3	N	17	·78	5	D	17	·31	**79**	2	Jr	26	·47	4 F 25 ·00
																	80	6	Jr	15	·84	
																		1	F	14	·37	2 Mr 14○ ·90
	5	S	8●○	·08	6	O	7	·61	1	N	6	·14	2	D	5	·67	**81**	4	Jr	4	·20	
	2	Au	28	·45	3	S	26	·98	5	O	26	·51	7	N	25	·04		1	D	24	·57	5 F 2○ ·73 7 Mr 4 ·26
	1	S	16	·35	2	O	15	·88	4	N	14	·41	5	D	13	·94	**82**	3	Jr	23○	·10	4 F 21 ·68
																		2	F	11	·00	3 Mr 12 ·53
	5	S	5	·71	7	O	5	·24	1	N	3	·77	3	D	3	·30	**83**	7	Jr	12○	·47	
																	84	4	Jr	1●	·84	6 Jr 31 ·37 7 F 29 ·90
	4	S	23	·61	6	O	23	·14	7	N	21○	·67	2	D	21●	·20	**85**	3	Jr	19	·73	
																		5	F	18	·26	6 Mr 19 ·79
	1	S	12	·98	3	O	12	·51	5	N	11○	·04	6	D	10	·57	**86**	1	Jr	9	·10	
	6	S	2	·84	7	O	1	·88	2	O	31○	·41	3	N	29	·94		5	D	29	·47	2 F 7 ·63 4 Mr 9 ·16
	5	S	21	·24	6	O	20	·77	1	N	19	·30	2	D	18	·83	**87**	7	Jr	28	·00	1 F 26 ·53
																	88	4	Jr	17	·36	
																		5	F	15	·90	7 Mr 16○ ·48
	2	S	9	·61	4	O	9●	·14	5	N	7	·67	7	D	7	·20	**89**	1	Jr	5	·73	
	6	Au	29○	·98	1	S	28	·51	3	O	28	·04	4	N	26	·57		6	D	26	·10	3 F 4 ·26 4 Mr 5○ ·79
																	90	7	Jr	24	·63	2 F 23○ ·16
	5	S	17	·87	7	O	17	·40	1	N	15	·94	3	D	15	·47	**91**	5	Jr	14	·00	
																		6	F	12	·53	1 Mr 14 ·06
	3	S	7	·24	4	O	6	·77	6	N	5	·30	7	D	4	·83	**92**	2	Jr	3	·36	
	7	Au	26	·61	{2	S	25	·14	**Mārgaśīrsha**				5	N	23	·20						3 F 1● ·89 5 Mr 2 ·42
					{3	O	24	·67	**Kshaya.**									6	D	22○	·73	
	6	S	14	·51	1	O	14	·04	2	N	12	·57	4	D	12○	·10	**93**	1	Jr	21	·26	{2 F 19 ·79 / 4 Mr 21 ·32}
	3	S	3	·87	5	O	3	·40	6	N	1	·93	1	D	1●○	·46	**94**	5	Jr	10	·63	
																		3	D	31	·00	7 F 9 ·16 1 Mr 10 ·69
	2	S	22	·77	4	O	22	·30	5	N	20●	·83	7	D	20	·36	**96**	1	Jr	18	·89	4 Jr 29 ·53 6 F 28 ·06
	7	S	11	·14	1	O	10○	·67	3	N	9	·20	4	D	8	·73	**95**	3	F	17	·42	4 Mr 17 ·95
	4	Au	31	·50	6	S	30○	·04	7	O	29	·57	2	N	28	·10	**97**	6	Jr	7	·26	
																		3	D	27	·63	7 F 5 ·79 2 Mr 7 ·32
	3	S	19○	·40	4	O	18	·93	6	N	17	·46	7	D	16	·99	**98**	5	Jr	26	·16	6 F 24 ·69
																	99	2	Jr	15	·52	
																		4	F	14	·06	5 Mr 15● ·59
	7	S	8	·77	2	O	8	·30	3	N	6	·83	5	D	6	·36	**900**	6	Jr	4	·89	
	5	Au	28	·14	6	S	26	·67	1	O	26	·20	2	N	24	·73		4	D	24	·26	1 F 3○ ·42 2 Mr 3 ·95
																	02	3	Jr	12	·16	**01** 5 Jr 22●○ ·80 7 F 21 ·33
	4	S	16	·04	5	O	15	·57	7	N	14	·10	1	D	13	·63						
	1	S	5	·41	2	O	4	·94	4	N	3	·47	6	D	3○	·00	**03**	7	Jr	1	·53	4 F 10 ·69 6 Mr 12 ·22
																						2 Jr 31 ·06 3 Mr 1 ·59

A.D. 999 see pages 238 to 241 below.

For tithis by Brahma siddhānta add algebraically — ·04 to the above.

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Commencement of solar year. Month and day A.D.	Fraction of day.	First new-moon in solar year.	Anomaly of first new-moon.	Christian era.	Vaiśākha. Week-day.	Month.	Day.	Fraction.	Jyeshṭha. Week-day.	Month.	Day.	Fraction.	Āshāḍha. Week-day.	Month.	Day.	Fraction.	Śrāvaṇa. Week-day.	Month.	Day.	Fraction.	Bhādrapada. Week-day.	Month.	Day.	Fraction.
							A.D.																				
4004	960	825	22M	·6094	8·50973	21·142	903	5	Mr	31	·12	6	Ap	29	·65	1	My	29○	·18	2	Je	27	·71	4	Jl	27	·24
																								5	Au	25	·77
4005	961	826	21M	·8680	27·14876	19·275	904	4	Ap	18	·02	5	My	17○	·55	7	Je	16	·08	1	Jl	15	·61	3	Au	14	·14
4006	962	827	22M	·1267	16·25719	15·433	905	1	Ap	7	·39	2	My	6●○	·92	4	Je	5	·45	5	Jl	4	·98	7	Au	3	·51
4007	963	828	22M	·3854	5·36563	11·591	906	5	Mr	27	·75	7	Ap	26●	·28	1	My	25	·81	3	Je	24	·34	6	Au	22	·41
																				4	Jl	23	·88				
4008	964	829	22M	·6441	24·00466	9·725	907	4	Ap	15	·65	6	My	15	·18	7	Je	13	·71	2	Jl	13	·24	3	Au	11	·77
4009	965	830	21M	·9028	13·11308	5·883	908	2	Ap	4	·02	3	My	3	·55	5	Je	2	·08	6	Jl	1	·61	1	Jl	31	·14
4010	966	831	22M	·1614	2·22152	2·040	909	6	Mr	24	·39	7	Ap	22	·92	3	Je	20	·98	5	Jl	20	·51	1	Au	19○	·04
												2	My	22	·45												
4011	967	832	22M	·4201	20·86055	0·174	910	5	Ap	12	·28	6	My	11	·81	1	Je	10	·34	2	Jl	9○	·87	4	Au	8	·40
4012	968	833	22M	·6788	9·96898	23·886	911	2	Ap	1	·65	4	My	1	·18	5	My	30	·71	7	Je	29○	·24	1	Jl	28	·77
4013	969	834	21M	·9375	28·80801	22·020	912	1	Ap	19	·55	3	My	19	·08	4	Je	17○	·81	6	Jl	17	·14	7	Au	15	·67
4014	970	835	22M	·1962	17·71644	18·178	913	5	Ap	8	·92	7	My	8	·44	1	Je	6●	·98	3	Jl	6	·51	5	Au	5	·04
4015	971	836	22M	·4549	6·82487	14·335	914	3	Mr	29	·28	4	Ap	27○	·81	6	My	27	·34	7	Je	25	·88	3	Au	23	·94
																				2	Jl	25	·40				
4016	972	837	22M	·7135	25·46390	13·469	915	2	Ap	17○	·18	3	My	16	·71	5	Je	15	·24	6	Jl	14	·77	1	Au	13	·30
4017	973	838	21M	·9722	14·57234	8·627	916	6	Ap	5●○	·55	1	My	5	·08	2	Je	3	·61	4	Jl	3	·14	5	Au	1	·67
4018	974	839	22M	·2309	3·68077	4·785	917	3	Mr	25	·91	5	Ap	24	·44	6	My	23	·97	3	Jl	22	·04	4	Au	20	·57
																1	Je	22	·50								
4019	975	840	22M	·4896	22·31980	2·910	918	2	Ap	13	·81	4	My	13	·34	5	Je	11	·87	7	Jl	11	·40	1	Au	9○	·93
4020	976	841	22M	·7483	11·42823	26·631	919	7	Ap	3	·18	1	My	2	·71	3	Je	1	·24	4	Je	30	·77	6	Jl	30○	·30
4021	977	842	22M	·0069	0·53686	22·789	920	4	Mr	22	·54	7	My	20	·61	2	Je	19	·14	3	Jl	18●	·67	5	Au	17	·20
								6	Ap	21	·08																
4022	978	843	21M	·2656	19·17569	20·922	921	3	Ap	10	·44	4	My	9	·97	6	Je	8○	·50	1	Jl	8●	·03	2	Au	6	·56
4023	979	844	22M	·5243	8·28413	17·080	922	7	Mr	30	·81	2	Ap	29	·34	3	My	28○	·87	5	Je	27	·40	6	Jl	26	·93
																								1	Au	25	·46
4024	980	845	22M	·7830	28·92314	15·214	923	6	Ap	18	·71	1	My	18○	·24	2	Je	16	·77	4	Jl	16	·30	5	Au	14	·83
4025	981	846	22M	·0417	16·08158	11·372	924	4	Ap	7	·07	5	My	6	·60	7	Je	5	·14	1	Jl	4	·67	3	Au	3	·20
4026	982	847	22M	·3008	5·14002	7·529	925	1	Mr	27○	·44	2	Ap	25	·97	4	My	25	·50	7	Jl	23	·56	2	Au	22	·09
																6	Je	24	·03								
4027	983	848	22M	·5580	23·77904	5·663	926	7	Ap	15	·34	1	My	14	·87	3	Je	13	·40	4	Jl	12	·93	6	Au	11	·46
4028	984	849	22M	·8157	12·88748	1·821	927	4	Ap	4	·71	6	My	4	·24	7	Je	2	·77	2	Jl	2	·30	3	Jl	31	·83
4029	985	850	22M	·0764	1·99592	25·533	928	2	Mr	24	·07	3	Ap	22	·60	6	Je	20	·66	1	Jl	20○	·20	2	Au	18●	·73
												5	My	22	·13												
4030	986	851	22M	·2351	20·63493	23·667	929	7	Ap	11	·97	2	My	11	·50	4	Je	10	·03	5	Jl	9○	·56	7	Au	8	·09
4031	987	852	22M	·5937	9·74337	19·822	930	5	Ap	1	·34	6	Ap	30	·87	1	My	30	·40	2	Je	28●○	·93	4	Jl	28	·46
4032	988	853	22M	·8524	28·38240	17·959	931	4	Ap	20	·24	5	My	19	·77	7	Je	18	·30	1	Jl	17	·83	3	Au	16	·36
4033	989	854	22M	·1111	17·49083	14·116	932	1	Ap	8	·60	3	My	8○	·13	4	Je	6	·66	6	Jl	6	·19	7	Au	4	·72
4034	990	855	22M	·3698	6·59927	10·274	933	5	Mr	28	·97	7	Ap	27○	·50	2	My	27	·03	3	Je	25	·56	6	Au	23	·62
																				5	Jl	25	·09				
4035	991	856	22M	·6285	25·23830	8·408	934	4	Ap	16○	·87	6	My	16	·40	7	Je	14	·93	2	Jl	14	·46	3	Au	12	·99
4036	992	857	22M	·8871	14·34672	4·565	935	2	Ap	6●	·23	3	My	5	·76	5	Je	4	·30	6	Jl	3	·83	1	Au	2	·36
4037	993	858	22M	·1458	3·45516	0·723	936	6	Mr	25	·60	1	Ap	24	·13	4	Je	22	·19	5	Jl	21	·72	7	Au	20○	·25
												2	My	23	·66												
4038	994	859	22M	·4045	22·09419	26·412	937	5	Ap	13	·50	7	My	13	·03	1	Je	11	·56	3	Jl	11	·09	4	Au	9○	·62
4039	995	860	22M	·6632	11·20292	22·570	938	2	Ap	2	·87	4	My	2	·40	5	My	31	·93	7	Je	30	·46	1	Jl	29	·99
4040	996	861	22M	·9219	0·31105	18·727	939	7	Mr	23	·23	3	My	21	·29	4	Je	19○	·82	6	Jl	19●	·36	7	Au	17	·89
								1	Ap	21	·76																
4041	997	862	22M	·1805	18·95008	16·861	940	6	Ap	10	·13	7	My	9	·66	2	Je	8○	·19	3	Jl	7●	·72	5	Au	6	·25
4042	998	863	22M	·4392	8·05851	13·019	941	3	Mr	30	·50	5	Ap	29	·03	6	My	28○	·56	1	Je	27	·09	2	Jl	26	·62
																								4	Au	25	·15
4043	999	864	22M	·6979	26·69754	11·152	942	2	Ap	18	·40	3	My	17●	·93	5	Je	16	·46	6	Jl	15	·99	1	Au	14	·52
4044	1000	865	22M	·9566	15·80598	7·310	943	6	Ap	7○	·76	1	My	7●	·29	2	Je	5	·82	4	Jl	5	·35	5	Au	3	·88
4045	1001	866	22M	·2153	4·91441	3·468	944	4	Mr	27○	·13	5	Ap	25	·67	7	My	25	·19	3	Jl	23	·25	4	Au	21	·78
																1	Je	23	·72								
4046	1002	867	22M	·4739	23·55343	1·601	945	3	Ap	15	·83	4	My	14	·56	6	Je	13	·09	7	Jl	12	·62	2	Au	11	·15
4047	1003	868	22M	·7326	12·66157	25·314	946	7	Ap	4	·39	1	My	3	·92	3	Je	2	·46	4	Jl	1	·99	6	Jl	31	·52
4048	1004	869	22M	·9913	1·77020	21·472	947	4	Mr	24	·76	6	Ap	23	·29	2	Je	21	·35	3	Jl	20○	·88	5	Au	19	·41
												7	My	22	·82												
4049	1005	870	22M	·2500	20·40933	19·605	948	3	Ap	11	·66	5	My	11	·19	6	Je	9	·72	1	Jl	9●○	·25	2	Au	7	·78
4050	1006	871	22M	·5087	9·51777	15·783	949	1	Ap	1	·03	2	Ap	30	·56	4	My	30	·09	5	Je	28●	·62	7	Jl	28	·15
4051	1007	872	22M	·7674	28·15678	13·896	950	6	Ap	19	·92	1	My	19○	·45	2	Je	17●	·98	4	Jl	17	·52	6	Au	16	·05
4052	1008	873	22M	·0260	17·26522	10·055	951	4	Ap	9	·29	5	My	8○	·82	7	Je	7	·35	1	Jl	6	·88	3	Au	5	·41
4053	1009	874	22M	·2847	6·37366	6·212	952	1	Mr	28	·66	3	Ap	27●○	·19	4	My	26	·72	6	Je	25	·25	2	Au	23	·31
																				7	Jl	24	·78				
4054	1010	875	22M	·5434	25·01368	4·346	953	7	Ap	16●	·56	2	My	16	·09	3	Je	14	·62	5	Jl	14	·15	6	Au	12	·68
4055	1011	876	22M	·8021	14·12112	0·504	954	4	Ap	5	·92	6	My	5	·45	7	Je	3	·98	2	Jl	3	·51	4	Au	2	·04
4056	1012	877	23M	·0608	3·22955	24·216	955	2	Mr	26	·29	3	Ap	24	·82	6	Je	22	·88	1	Jl	22	·41	2	Au	20○	·94
												5	My	24	·35												
4057	1013	878	22M	·3194	21·86858	22·350	956	1	Ap	13	·19	2	My	12	·72	4	Je	11	·25	5	Jl	10	·78	7	Au	9	·31
4058	1014	879	22M	·5781	10·97701	18·508	957	5	Ap	2	·55	7	My	2	·08	1	My	31	·62	3	Je	30	·15	4	Jl	29	·68

* For Sūrya siddhānta figures for A.D. 500 to
Ending moments of tithis are the same for Ārya and Sūrya siddhāntas.

from A.D. 500 to A.D. 999 (Ārya siddhānta)*—*cont.*

Āśvina.				Kārttika.				Mārgaśīrsha.				Pausha.			A.D.	Māgha.			A.D.	Phālguna.			Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.		Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
7 S	24		·30	1 O	23		·84	3 N	22○		·37	4 D	21		·90												
4 S	12		·67	6 O	12		·20	7 N	10●○		·73	2 D	10		·26	04	6	Jr	20	·43							
2 S	2		·04	3 O	1		·57	5 O	31		·10	6 N	29		·63						7	F	18	·96	2	Mr	19	·49
7 S	20		·94	2 O	20		·47	4 N	19		·00	5 D	18		·53	05	3	Jr	8	·79							
5 S	10○		·30	6 O	9●		·83	1 N	8		·36	2 D	7		·90		1	D	29	·16	5	F	7	·32	6	Mr	8	·86
2 Au	29○		·67	4 S	28		·20	5 O	27		·73	7 N	26		·26	06	2	Jr	27	·69	4	F	26	·22				
1 S	17		·57	3 O	17		·10	4 N	15		·63	6 D	15		·16	07	7	Jr	17	·06	1	F	15	·59	3	Mr	17○	·12
5 S	6		·94	7 O	6		·47	2 N	5		·00	3 D	4		·53	08	4	Jr	6	·43	5	F	4	·96	7	Mr	5●○	·49
{3 Au	27		·30														1	D	25	·79								
{4 S	25		·84	6 O	25		·36	7 N	23		·90	**Pausha. Kshaya.**				09	3	Jr	24	·32	4	F	22	·85				
2 S	14		·20	3 O	13		·73	5 N	12		·26	6 D	11○		·79	10	7	Jr	13	·69	2	F	12	·22	3	Mr	13	·75
6 S	3		·57	1 O	3		·10	2 N	1		·63	4 D	1		·16	11	5	Jr	3○	·06	6	F	1●	·59	1	Mr	3	·12
5 S	22		·46	7 O	22○		·00	1 N	20●		·53	3 D	20		·06		2	D	23○	·42	{5	F	20	·49				
2 S	11		·83	4 O	11○		·36	5 N	9		·90	7 D	9		·42	12	3	Jr	21	·96	{7	Mr	21	·02				
7 Au	31		·20	1 S	29○●		·73	3 O	29		·26	4 N	27		·79	13	1	Jr	10	·32	2	F	8	·86	4	Mr	10	·38
6 S	19●		·10	7 O	18		·63	2 N	17		·16	3 D	16		·69		5	D	30	·69	7	Jr	29	·22	1	F	27	·75
3 S	8●		·46	4 O	7		·99	6 N	6		·52	1 D	6		·06	14												
7 Au	28		·83	2 S	27		·36	3 O	26		·89	5 N	25		·42	15	4	Jr	18	·62	6	F	17	·12	7	Mr	18	·65
6 S	15		·73	1 O	15		·26	2 N	13		·79	4 D	13○		·32	16	1	Jr	7	·96	3	F	6	·48	5	Mr	7	·02
4 S	5		·10	5 O	4		·63	7 N	3		·16	1 D	2○		·69		6	D	27	·32	7	Jr	25	·85	2	F	24	·38
3 S	24		·00	4 O	23		·53	6 N	22○		·05	7 D	21		·58	17												
7 S	13		·36	1 O	12		·89	3 N	11●		·42	4 D	10		·95	18	5	Jr	15	·22	6	F	13○	·75	1	Mr	15	·28
4 S	1		·78	6 O	1		·26	7 O	30		·79	2 N	29		·32	19	2	Jr	4	·59	4	F	3○	·12	5	Mr	4	·65
3 S	20○		·62	5 O	20		·16	6 N	18		·69	1 D	18		·22		6	D	24	·95	1	Jr	23●	·48	3	F	22	·01
7 S	9○		·99	2 O	9		·52	4 N	8		·05	5 D	7		·58	21	5	Jr	11●	·85	7	F	10	·38	1	Mr	11	·91
5 Au	30●○		·36	6 S	28		·89	1 O	28		·42	2 N	26		·95	22	3	Jr	1	·22	4	Jr	30	·75	6	Mr	1	·28
4 S	17		·26	5 O	16		·79	7 N	15		·32	1 D	14		·85	23	2	Jr	20	·12	3	F	18	·65	5	Mr	20	·18
1 S	6		·62	3 O	6		·15	4 N	4		·68	6 D	4		·22	24	6	Jr	9	·48								
{5 Au	26		·99														3	D	28	·85	1	F	8	·01	2	Mr	8	·54
{7 S	25		·52	2 O	25		·05	3 N	23		·58	5 D	23○		·11	25	5	Jr	27	·38	6	F	25	·91				
4 S	14		·89	6 O	14		·42	7 N	12		·95	2 D	12●		·57		4	F	15	·28	5	Mr	16○	·81				
2 S	3		·26	3 O	2		·79	5 N	1○		·32	6 N	30		·85	26	2	Jr	16	·75								
1 S	22		·15	2 O	21○		·69	4 N	20		·21	5 D	19		·74	27	7	Jr	6	·11	1	F	4	·64	3	Mr	6●	·18
5 S	11		·52	7 O	11○		·05	1 N	9		·58	3 D	9		·11		4	D	26	·48	6	Jr	25	·01	7	F	23●	·54
2 Au	31		·89	4 S	30●		·42	5 O	29		·95	7 N	28		·48	28												
1 S	18●		·78	3 O	18		·32	4 N	16		·85	6 D	16		·38	29	3	Jr	13○	·38	4	F	11	·91	6	Mr	13	·44
6 S	8		·15	7 O	7		·68	2 N	6		·21	3 D	5		·74	30	7	Jr	2○	·75	2	F	1	·28	3	Mr	2	·81
3 Au	28		·52	5 S	27		·05	6 O	26		·58	1 N	25		·11	31	6	Jr	21	·64	1	F	20	·17	2	Mr	21	·70
2 S	16		·42	3 O	15		·95	5 N	14		·48	7 D	14○		·01	32	4	Jr	11	·01	5	F	9	·54	7	Mr	10	·07
6 S	4		·78	1 O	4		·31	2 N	2		·84	4 D	2○		·38		1	D	30	·38	2	Jr	28	·91	4	F	27	·44
5 S	23		·68	7 O	23		·21	1 N	21		·74	3 D	21		·27	34	7	Jr	18	·28	1	F	16	·81	3	Mr	18	·34
3 S	13		·05	4 O	12		·58	6 N	11●		·11	7 D	10		·64	35	4	Jr	7	·64	6	F	6	·17	7	Mr	7	·70
7 S	2		·42	1 O	1○		·95	3 O	31		·48	5 N	30		·01		2	D	28	·01	3	Jr	26	·54	5	F	25○	·07
6 S	20●○		·31	7 O	19		·84	2 N	18		·37	3 D	17		·90	37	7	Jr	14	·91	2	F	13●○	·44	3	Mr	14	·97
3 S	9●○		·68	5 O	9		·21	6 N	7		·74	1 D	7		·27	38	5	Jr	4	·27	6	F	2●○	·80	1	Mr	4	·84
1 Au	30		·05	2 S	28		·58	4 O	28		·11	5 N	26		·64		2	D	24○	·64	4	Jr	23●	·17	5	F	21	·70
6 S	17		·94	1 O	17		·48	3 N	16		·01	4 D	15		·54	39												
4 S	6		·31	5 O	5		·84	7 N	4		·37	1 D	3		·90	40	1	Jr	12	·54	3	F	11	·07	4	Mr	11	·60
{1 Au	26		·68														5	D	31	·91	7	Jr	30	·44	1	F	28	·97
{3 S	25		·21	4 O	24		·74	6 N	23		·27	7 D	22●		·80	41												
7 S	14		·58	2 O	14		·11	3 N	12○		·64	8 D	12		·17	42	4	Jr	19	·80	6	F	18	·33	7	Mr	19	·86
4 S	3		·94	6 O	3		·47	1 N	2○		·00	2 D	1		·54	43	2	Jr	9	·17	3	F	7	·70	5	Mr	9	·23
3 S	21		·84	5 O	21○		·37	6 N	19		·90	1 D	19		·43		6	D	29	·54	1	Jr	28	·07	2	F	26	·60
1 S	11		·21	2 O	10		·74	4 N	9		·27	5 D	8		·80	44												
5 Au	31○		·58	7 S	30		·11	1 O	29		·64	3 N	28		·17	45	5	Jr	16	·44	6	F	14	·96	1	Mr	16	·50
4 S	19		·47	6 O	19		·00	7 N	17		·53	2 D	17		·06	46	2	Jr	5	·80	4	F	4	·33	5	Mr	5●	·86
1 S	7		·84	3 O	7		·37	4 N	5		·90	6 D	5		·43		7	D	26	·17	1	Jr	24○	·70	3	F	23	·23
6 Au	28		·21	7 S	26		·74	2 O	26		·27	3 N	24		·80	47												
																48	6	Jr	14○	·07	7	F	12	·60	2	Mr	13	·18
																49	3	Jr	2○	·43	4	Jr	31	·96	6	Mr	2	·50
																50	2	Jr	21	·33	3	F	19	·86	5	Mr	21	39
																51	6	Jr	10	·70	1	F	9	·23	2	Mr	10	·76
																	4	D	31	·07	5	Jr	29	·60	7	F	28	·18
																53	2	Jr	17	·96	4	F	16	·49	6	Mr	18	·02
																54	7	Jr	7	·33	1	F	5	·86	3	Mr	7○	·39
																	4	D	27	·70	6	Jr	26	·23	7	F	24●○	·76
																56	3	Jr	15	·60	5	F	14○	·13	6	Mr	14	·66
																57	7	Jr	3○	·96	2	F	2	·49	4	Mr	4	·02
																	5	D	24○	·33	6	Jr	22	·86	1	F	21	·39

A.D. 999 see pages 238 to 241 below

For tithis by Brahma siddhānta add algebraically —·04 to the above.

TABLE II.—Solar years and new moons

Kaliyuga.	Vikrama era.	Śaka era.	Commencement of solar year. Month and day A.D.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	Christian era.	Vaiśākha. Week-day.	Month.	Day.	Fraction.	Jyeshṭha. Week-day.	Month.	Day.	Fraction.	Āshāḍha. Week-day.	Month.	Day.	Fraction.	Śrāvaṇa. Week-day.	Month.	Day.	Fraction.	Bhādrapada. Week-day.	Month.	Day.	Fraction.
							A.D.																				
4059	1015	880	22M	·8368	0·08538	14·665	**958**	2 Mr 22 4 Ap 21	·92 ·45	5	My	20	·98	7	Je	19○	·51	2	Jl	19●	·04	3	Au	17	·57
4060	1016	881	23M	·0955	18·72508	12·800	**959**	1 Ap	10	·82	3	My	10	·35	4	Je	8●○	·88	6	Jl	8	·41	7	Au	6	·94
4061	1017	882	22M	·3542	7·83291	8·957	**960**	6 Mr	30	·19	7	Ap	28	·72	2	My	28●	·25	3	Je	26	·78	5 6	Jl Au	26 24	·31 ·84
4062	1018	883	22M	·6128	26·47194	7·101	**961**	5 Ap	18○	·08	6	My	17●	·61	1	Je	16	·14	2	Jl	15	·68	4	Au	14	·21
4063	1019	884	22M	·8715	15·58087	3·248	**962**	2 Ap	7○	·45	3	My	6	·98	5	Je	5	·51	7	Jl	5	·04	1	Au	3	·57
4064	1020	885	23M	·1302	4·68880	26·961	**963**	6 Mr	27○	·82	1	Ap	26	·35	2 4	My Je	25 24	·88 ·41	5	Jl	23	·94	7	Au	22	·47
4065	1021	886	22M	·3889	23·32783	25·094	**964**	5 Ap	14	·72	7	My	14	·25	1	Je	12	·78	3	Jl	12	·31	4	Au	10	·84
4066	1022	887	22M	·6476	12·43627	21·252	**965**	3 Ap	4	·08	4	My	3	·61	6	Je	2	·14	7	Jl	1	·67	2	Jl	31○	·20
4067	1023	888	22M	·9062	1·54469	17·410	**966**	7 Mr	24	·45	1 Ap 3 My	22 22	·98 ·51	5	Je	21	·04	6	Jl	20○	·57	1	Au	19	·10
4068	1024	889	23M	·1649	20·18378	15·544	**967**	6 Ap	12	·35	7	My	11	·88	2	Je	10	·41	3	Jl	9●	·94	5	Au	8	·47
4069	1025	890	22M	·4236	9·29216	11·701	**968**	3 Mr	31	·71	5	Ap	30	·24	6	My	29○	·78	1	Je	28	31	2	Jl	27	·84
4070	1026	891	22M	·6823	27·93118	9·835	**969**	2 Ap	19	·61	4	My	19○	·14	5	Je	17	·67	7	Jl	17	·20	1	Au	15	·73
4071	1027	892	22M	·9410	17·03962	5·993	**970**	6 Ap	8	·98	1	My	8●○	·51	3	Je	7	·04	4	Jl	6	·57	6	Au	5	·10
4072	1028	893	23M	.1996	6·14815	2·151	**971**	4 Mr	29	·35	5	Ap	27	·88	7	My	27	·41	1 3	Je Jl	25 25	·94 ·47	5	Au	24	·00
4073	1029	894	22M	·4583	24·78707	0·284	**972**	3 Ap	18●	·24	4	My	15	·77	6	Je	14	·30	7	Jl	13	·84	2	Au	12	·37
4074	1030	895	22M	·7170	13·89551	23·997	**973**	7 Ap	5	·61	2	My	5	·14	3	Je	3	·67	5	Jl	3	·20	6	Au	1	·73
4075	1031	896	22M	·9757	3·00395	20·154	**974**	4 Mr	25	·98	6 Ap 1 My	24 24	·51 ·04	2	Je	22	·57	4	Jl	22	·10	5	Au	20●	·63
4076	1032	897	23M	·2344	21·64287	18·288	**975**	3 Ap	13	·88	5	My	13	·41	6	Je	11	·94	1	Jl	11	·47	3	Au	10●	·00
4077	1033	898	22M	·4930	10·75140	14·446	**976**	1 Ap	2	·24	2	My	1	·77	4	My	31	·30	5	Je	29○	·83	7	Jl	29	·36
4078	1034	899	22M	·7517	29·39043	12·580	**977**	7 Ap	21	·14	1	My	20	·67	3	Je	19○	·20	4	Jl	18	·73	6	Au	17	·26
4079	1035	900	23M	·0104	18·49886	8·737	**978**	4 Ap	10	·51	6	My	10	·04	7	Je	8●	·57	2	Jl	8	·10	3	Au	6	·63
4080	1036	901	23M	·2891	7·60730	4·895	**979**	1 Mr	30	·87	3	Ap	29○	·40	4	My	28	·94	6 1	Je Jl	27 27	·47 ·00	2	Au	25	·53
4081	1037	902	22M	·5278	26·24633	3·029	**980**	7 Ap	17○	·77	2	My	17●	·30	3	Je	15	·83	5	Jl	15	·36	6	Au	13	·89
4082	1038	903	22M	·7864	15·35476	26·741	**981**	5 Ap	7●○	·14	6	My	6	·67	1	Je	5	·20	2	Jl	4	·73	4	Au	3	·26
4083	1039	904	23M	·0451	4·46319	22·899	**982**	2 Mr	27●	·51	4	Ap	26	·04	5 7	My Je	25 24	·57 ·10	1	Jl	23	·63	3	Au	22	·16
4084	1040	905	23M	·3038	23·10222	21·033	**983**	1 Ap	15	·40	2	My	14	·93	4	Je	13	·46	6	Jl	13	·00	7	Au	11○	·53
4085	1041	906	23M	·5625	12·21065	17·190	**984**	5 Ap	3	·77	7	My	3	·30	1	Je	1	·83	3	Jl	1	·36	4	Jl	30○●	·89
4086	1042	907	22M	·8212	1·31909	13·348	**985**	3 Mr	24	·14	4 Ap 6 My	22 22	·67 ·20	7	Je	20	·73	2	Jl	20○	·26	3	Au	18	·79
4087	1043	908	23M	·0799	19·95812	11·482	**986**	2 Ap	12	·03	3	My	11	·58	5	Je	10○	·10	6	Jl	9	·63	1	Au	8	·16
4088	1044	909	23M	·3385	9·06654	7·640	**987**	6 Ap	1	·40	7	Ap	30	·93	2	My	30○	·46	3	Je	28	·99	5	Jl	28	·52
4089	1045	910	22M	·5972	27·70557	5·773	**988**	5 Ap	19	·30	6	My	18●○	·83	1	Je	17	·36	2	Jl	16	·89	4	Au	15	·42
4090	1046	911	22M	·8559	16·81401	1·931	**989**	2 Ap	8●	·67	4	My	8●	·20	5	Je	6	·73	7	Jl	6	·26	1	Au	4	·79
4091	1047	912	23M	·1146	5·92244	25·643	**990**	7 Mr	29○	·03	1	Ap	27	·56	3	My	27	·09	4 6	Je Jl	25 25	·62 ·16	7	Au	23	·69
4092	1048	913	23M	·3733	24·56147	28·777	**991**	5 Ap	16	·93	7	My	16	·46	1	Je	14	·99	3	Jl	14	·52	5	Au	13	·05
4093	1049	914	22M	·6319	13·66991	19·935	**992**	3 Ap	5	·30	4	My	4	·83	6	Je	3	·36	7	Jl	2	·89	2	Au	1	·42
4094	1050	915	22M	·8906	2·77833	16·093	**993**	7 Mr	25	·66	2 Ap 3 My	24 23	·20 ·73	5	Je	22	·26	6	Jl	21	·79	1	Au	20●	·32
4095	1051	916	23M	·1493	21·41764	14·227	**994**	6 Ap	13	·56	1	My	13	·10	2	Je	11	·62	4	Jl	11○	·15	5	Au	9	·68
4096	1052	917	23M	·4080	10·52511	10·385	**995**	3 Ap	2	·93	5	My	2	·46	6	My	31	·99	1	Je	30○	·52	3	Jl	30	·05
4097	1053	918	22M	·6667	29·16482	8·518	**996**	2 Ap	20	·83	4	My	20	·36	5	Je	18	·89	7	Jl	18	·42	1	Au	16	·95
4098	1054	919	22M	·9253	18·27326	4·676	**997**	7 Ap	10	·19	1	My	9○	·72	3	Je	8	·26	4	Jl	7	·79	6	Au	6	·32
4099	1055	920	23M	·1840	7·38169	0·833	**998**	4 Mr	30	·56	6	Ap	29○	·09	7	My	28	·62	2 3	Je Jl	27 26	·15 ·68	5	Au	25	·21
4100	1056	921	23M	·4427	26·02072	26·522	**999**	3 Ap	18○	·46	4	My	17	·99	6	Je	16	·52	1	Jl	16	·05	2	Au	14	·58

* For Sūrya siddhānta figures for A.D. 500 to
Ending moments of tithis are the same for Ārya and Sūrya siddhāntas.

from A.D. 500 to A.D. 999 (Ārya siddhānta)*—*cont.*

Āśvina.			Kārttika.			Mārgaśīrsha.			Pausha.		A.D.	Māgha.			A.D.	Phālguna.			Chaitra	
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.		Fraction.	Week-day.	Month.	Day.		Fraction.	Week-day.	Month.	Day.	Fraction.
5 S	16		·10	6 O	15		·64	1 N	14		·17	2 D	13●	○	·70	**59**	4 Jr	12	·23			
2 S	5		·47	4 O	5		·00	5 N	3		·53	7 D	3		·06	**60**	1 Jr	1	·59			
1 S	23		·37	2 O	22		·90	4 N	21		·43	5 D	20		·96	**61**	7 Jr	19	·49			
5 S	12		·74	7 O	12○		·27	1 N	10		·80	3 D	10		·33	**62**	4 Jr	8	·86			
3 S	2		·10	4 O	1○		·65	6 O	31		·16	7 N	29		·70		2 D	29	·23			
2 S	21○		·00	3 O	20		·53	5 N	19		·06	6 D	18		·59	**64**	1 Jr	17	·12			
6 S	9		·37	7 O	8		·90	2 N	7		·43	3 D	6		·96	**65**	5 Jr	5	·49			
3 Au	29		·74	5 S	28		·27	6 O	27		·80	1 N	26		·33		2 D	25	·86			
2 S	17		·63	4 O	17		·16	5 N	15		·69	7 D	15		·22	**67**	1 Jr	13○	·76			
7 S	7		·00	1 O	6		·53	3 N	5		·06	4 D	4		·59	**68**	6 Jr	3	·12			
4 Au	26		·37																			
5 S	24		·90	7 O	24		·43	1 N	22○		·96	3 D	22●		·49	**69**	5 Jr	21	·02			
3 S	14		·26	4 O	13		·80	6 N	12○		·33	7 D	11		·87	**70**	2 Jr	10	·39			
7 S	3		·63	2 O	3		·16	3 N	1●○		·69	5 D	1		·22		6 D	30	·75			
6 S	22		·53	1 O	22●		·06	2 N	20		·56	4 D	20		·12	**72**	5 Jr	18	·65			
3 S	10○		·90	5 O	10●		·43	6 N	8		·96	1 D	8		·49	**73**	3 Jr	7	·02			
1 Au	31○		·26	2 S	29		·79	4 O	29		·32	5 N	27		·86		7 D	27	·39			
7 S	19		·16	1 O	18		·69	3 N	17		·22	4 D	16		·75	**75**	6 Jr	15	·28			
4 S	8		·53	6 O	8		·06	7 N	6		·59	2 D	6		·12	**76**	3 Jr	4○	·65			
1 Au	27		·90	3 S	26		·43	4 O	25		·96	6 N	24		·49		1 D	24○	·02			
7 S	15		·79	2 O	15		·32	3 N	13		·85	5 D	13●		·39	**78**	6 Jr	11	·91			
5 S	5		·16	6 O	4		·69	1 N	3		·22	2 D	2●		·75	**79**	4 Jr	1	·28			
4 S	24		·06	5 O	23○		·59	7 N	22		·12	1 D	21		·65	**80**	3 Jr	20	·18			
1 S	12		·42	2 O	11○		·96	4 N	10		·49	6 D	10		·02	**81**	7 Jr	8	·55			
5 S	1		·79	7 O	1○		·32	1 O	30		·85	3 N	29		·38		4 D	28	·91			
4 S	20●		·69	6 O	20		·22	7 N	18		·75	2 D	18		·28	**83**	3 Jr	16	·81			
2 S	10		·06	3 O	9		·59	5 N	8		·12	6 D	7		·65	**84**	1 Jr	6	·18			
6 Au	29		·42	7 S	27		·95	2 O	27		·48	4 N	26		·02		5 D	25	·55			
5 S	17		·32	6 O	16		·85	1 N	15		·38	2 D	14		·91	**86**	4 Jr	30●	·44			
2 S	6		·69	4 O	6		·22	5 N	4		·75	7 D	4○		·28	**87**	1 Jr	2	·81			
7 Au	27		·05																			
1 S	25		·58	3 O	25		·12	4 N	23○		·65	6 D	23		·18	**88**	7 Jr	21	·71			
5 S	13		·96	7 O	13		·48	2 N	12●○		·01	3 D	11		·54	**89**	5 Jr	10	·07			
3 S	3		·32	4 O	2		·84	6 N	1●		·38	7 N	30		·91		2 D	30	·44			
2 S	22○		·22	3 O	21●		·75	5 N	20		·28	6 D	19		·81	**91**	1 Jr	18	·34			
6 S	11○		·58	1 O	11		·11	2 N	9		·64	4 D	9		·18	**92**	5 Jr	7	·71			
3 Au	30○		·95	5 S	29		·48	7 O	29		·01	1 N	27		·54		3 D	27	·07			
2 S	18		·85	4 O	18		·38	5 N	16		·91	7 D	16		·44	**94**	1 Jr	14○	·97			
7 S	8		·22	1 O	7		·75	3 N	6		·28	4 D	5		·81	**95**	6 Jr	4●○	·34			
4 Au	28		·58	6 S	27		·11	7 O	26		·64	2 N	25		·17		3 D	24	·70			
3 S	15		·48	5 O	15		·01	6 N	13		·54	1 D	13●		·07	**97**	2 Jr	11	·60			
7 S	4		·85	2 O	4		·38	3 N	2○		·91	5 D	2		·44		6 D	31	·97			
6 S	23		·74	1 O	23●○		·28	2 N	21		·81	4 D	21		·34	**99**	5 Jr	19	·87			
4 S	13		·11	5 O	12●○		·64	7 N	11		·17	1 D	10		·70	**00**	3 Jr	9	·23			
																	5 F	10	·76	7	Mr	12	·29
																	3 Jr	31	·12	4	F	29	·66
																	2 F	18	·02	3	Mr	19	·55
																	6 F	7	·39	7	Mr	8	·92
																63	3 Jr	27	·76	5	F	26	·29
																	2 F	15	·65	4	Mr	16	·18
																	7 F	4○	·02	1	Mr	5●	·55
																66	4 Jr	24○	·39	5	F	22	·92
																	3 F	12	·29	4	Mr	13	·82
																	7 F	1	·65	2	Mr	2	·18
																	6 F	19	·55	1	Mr	21	·08
																	3 F	8	·92	5	Mr	10	·45
																71	1 Jr	29	·28	2	F	27	·82
																	7 F	17	·18	1	Mr	17○	·71
																	4 F	5	·55	6	Mr	7○	·08
																74	1 Jr	25	·92	3	F	24●○	45
																	7 F	13●	·81	2	Mr	15	·34
																	5 F	3	·18	6	Mr	3	·71
																77	2 Jr	22	·55	4 F	21	·08
																				5 Mr	22	·81
																	1 F	10	·45	2	Mr	11	·98
																	5 Jr	30	·81	7	Mr	1	·34
																	4 F	18	·71	6	Mr	19	·24
																	2 F	7	·08	3	Mr	8	·61
																82	6 Jr	27	·44	7	F	25	·98
																	5 F	15○	·34	6	Mr	16	·87
																	2 F	4○	·71	4	Mr	5	·24
																85	7 Jr	24○	·08	1	F	22	·61
																	5 F	11	·97	7	Mr	18	·50
																	3 F	1	·34	4	Mr	2	·87
																	2 F	20	·24	3	Mr	20	·77
																	6 F	8	·60	1	Mr	10	·14
																90	3 Jr	28	·97	5	F	27	·50
																	2 F	16	·87	4	Mr	18●○	·40
																	7 F	6	·24	1	Mr	6●○	·77
																93	4 Jr	25	·60	6	F	24●	·13
																	3 F	13	·50	5	Mr	15	·03
																	7 F	2	·87	2	Mr	4	·40
																96	5 Jr	23	·24	6 F	21	·77
																				1 Mr	22	·30
																	4 F	10	·13	5	Mr	11	·66
																98	1 Jr	30	·50	3	Mr	1	·08
																	7 F	18	·40	1	Mr	19	·93
																00	4 F	7	·76	6	Mr	8	·30

A.D. 999 see pages 238 to 241 below.

For tithis by Brahma siddhānta add algebraically — ·05 to the above.

TABLE II.— Sūrya siddhānta figures

A.D.	Kaliyuga.	Week-day of 1st January.	Commencement of Indian solar year. Day.	Commencement of Indian solar year. Fraction of day.	First new moon in solar year.	Anomaly of first new moon.
500	3601	7	18M	·3613	27·3063	9·979
501	3602	1	18M	·6200	16·4146	6·137
502	3603	2	18M	·8788	5·5229	2·294
503	3604	4	19M	·1375	25·1618	0·427
504	3605	5	18M	·3963	13·2701	24·139
505	3606	6	18M	·6550	2·3784	20·296
506	3607	7	18M	·9138	21·0173	18·429
507	3608	2	19M	·1726	10·1256	14·587
508	3609	3	18M	·4313	28·7644	12·720
509	3610	4	18M	·6901	17·8727	8·877
510	3611	5	18M	·9488	6·9810	5·034
511	3612	7	19M	·2076	25·6199	3·168
512	3613	1	18M	·4663	14·7282	26·880
513	3614	2	18M	·7251	3·8365	23·037
514	3615	3	18M	·9869	22·4754	21·170
515	3616	5	19M	·2426	11·5837	17·327
516	3617	6	18M	·5014	0·6920	13·485
517	3618	7	18M	·7601	19·3309	11·618
518	3619	2	19M	·0189	8·4392	7·775
519	3620	3	19M	·2776	27·0781	5·908
520	3621	4	18M	·5364	16·1864	2·066
521	3622	5	18M	·7952	5·2947	25·777
522	3623	7	19M	·0569	23·9336	23·911
523	3624	1	19M	·3127	13·0419	20·068
524	3625	2	18M	·5714	2·1502	16·225
525	3626	3	18M	·8302	20·7891	14·358
526	3627	5	19M	·0889	9·8974	10·516
527	3628	6	19M	·3477	28·5362	8·649
528	3629	7	18M	·6065	17·6445	4·806
529	3630	1	18M	·8652	6·7528	0·963
530	3631	3	19M	·1240	25·3917	26·651
531	3632	4	19M	·3827	14·5000	22·809
532	3633	5	18M	·6415	3·6083	18·966
533	3634	6	18M	·9002	22·2472	17·099
534	3635	1	19M	·1590	11·2555	13·256
535	3636	2	19M	·4177	0·4638	9·414
536	3637	3	18M	·6765	19·1027	7·547
537	3638	4	18M	·9353	8·2110	3·704
538	3639	6	19M	·1940	26·8499	1·837
539	3640	7	19M	·4518	15·9582	25·549
540	3641	1	18M	·7115	5·0965	21·706
541	3642	2	18M	·9703	23·7054	19·840
542	3643	4	19M	·2290	12·8137	15·997
543	3644	5	19M	·4868	1·9220	12·154
544	3645	6	18M	·7466	20·5608	10·277
545	3646	1	19M	·0053	9·6891	6·445
546	3647	2	19M	·2641	28·3080	4·578
547	3648	3	19M	·5228	17·4163	0·735
548	3649	4	18M	·7816	6·5246	24·447
549	3650	6	19M	·0403	25·1635	22·580
550	3651	7	19M	·2991	14·2718	18·737
551	3652	1	19M	·5579	3·3801	14·894
552	3653	2	18M	·8166	22·0190	13·028
553	3654	4	19M	·0754	11·1273	9·185
554	3655	5	19M	·3341	0·2356	5·343
555	3656	6	19M	·5929	18·8745	3·476
556	3657	7	18M	·8516	7·9828	27·188
557	3658	2	19M	·1104	26·6217	25·321
558	3659	3	19M	·3692	15·7300	21·478
559	3660	4	19M	·6279	4·8383	17·635
560	3661	5	18M	·8867	23·4772	15·769
561	3662	7	19M	·1454	12·5854	11·926
562	3663	1	19M	·4042	1·6937	8·083
563	3664	2	19M	·6629	20·3826	6·216
564	3665	3	18M	·9217	9·4409	2·374
565	3666	5	19M	·1805	28·0798	0·507
566	3667	6	19M	·4392	17·1881	24·219
567	3668	7	19M	·6980	6·2964	20·376
568	3669	1	18M	·9597	24·9353	18·509
569	3670	3	19M	·2155	14·0436	14·666
570	3671	4	19M	·4742	3·1519	10·824
571	3672	5	19M	·7330	21·7908	8·957
572	3673	6	18M	·9918	10·8991	5·114
573	3674	1	19M	·2505	0·0074	1·271
574	3675	2	19M	·5093	18·6463	26·959
575	3676	3	19M	·7680	7·7546	23·117
576	3677	5	19M	·0268	23·3935	21·250
577	3678	6	19M	·2855	15·5018	17·407
578	3679	7	19M	·5443	4·6101	13·564
579	3680	1	19M	·8031	23·2489	11·698
580	3681	3	19M	·0618	12·3572	7·855
581	3682	4	19M	·3206	1·4655	4·013
582	3683	5	19M	·5793	20·1044	2·145
583	3684	6	19M	·8381	9·2127	25·857
584	3685	1	19M	·0958	27·8516	23·990
585	3686	2	19M	·3556	16·9599	20·148
586	3687	3	19M	·6143	6·0682	16·305
587	3688	4	19M	·8731	24·7071	14·438
588	3689	6	19M	·1319	13·8154	10·595
589	3690	7	19M	·3906	2·9237	6·753
590	3691	1	19M	·6494	21·5626	4·886
591	3692	2	19M	·9081	10·6709	1·043
592	3693	4	19M	·1669	29·3098	26·731
593	3694	5	19M	·4256	18·4181	22·888
594	3695	6	19M	·6844	7·5264	19·045
595	3696	7	19M	·9432	26·1653	17·179
596	3697	2	19M	·2019	15·2736	13·336
597	3698	3	19M	·4607	4·3819	9·493
598	3699	4	19M	·7194	23·0207	7·627
599	3700	5	19M	·9782	12·1290	3·784
600	3701	7	19M	·2369	1·2373	27·496
601	3702	1	19M	·4957	19·8762	25·629
602	3703	2	19M	·7545	8·9845	21·786
603	3704	4	20M	·0132	27·6234	19·919
604	3705	5	19M	·2720	16·7317	16·077
605	3706	6	19M	·5307	5·8400	12·234
606	3707	7	19M	·7895	24·4789	10·367
607	3708	2	20M	·0482	13·5872	6·524
608	3709	3	19M	3070	2·6955	2·681
609	3710	4	19M	·5658	21·3344	0·815
610	3711	5	19M	·8245	10·4427	24·527
611	3712	7	20M	·0833	29·0816	22·660
612	3713	1	19M	·3420	18·1899	18·817
613	3714	2	19M	·6008	7·2982	14·974
614	3715	3	19M	·8595	25·9370	13·107
615	3716	5	20M	·1183	15·0153	9·265
616	3717	6	19M	·3771	4·1536	5·423
617	3718	7	19M	·6358	22·7525	3·555
618	3719	1	19M	·8946	11·9008	27·267
619	3720	3	20M	·1533	1·0091	23·425
620	3721	4	19M	·4121		
621	3722	5	19M	·6708		
622	3723	6	19M	·9296		
623	3724	1	20M	·1884		
624	3725	2	19M	·4471		
625	3726	3	19M	·7059		
626	3727	4	19M	·9646		
627	3728	6	20M	·2234		
628	3729	7	19M	·4821		
629	3730	1	19M	·7409		
630	3731	2	19M	·9996		
631	3732	4	20M	·2584		
632	3733	5	19M	·5172		
633	3734	6	19M	·7759		
634	3735	1	20M	·0347		
635	3736	2	20M	·2934		
636	3737	3	19M	·5522		
637	3738	4	19M	·8109		
638	3739	6	20M	·0697		
639	3740	7	20M	·3285		
640	3741	1	19M	·5872		
641	3742	2	19M	·8460		
642	3743	4	20M	·1047		
643	3744	5	20M	·3635		
644	3745	6	19M	·6222		
645	3746	7	19M	8810		
646	3747	2	20M	·1298		
647	3748	3	20M	·3985		
648	3749	4	19M	·6573		
649	3750	5	19M	·9163		
650	3751	7	20M	·1748		
651	3752	1	20M	·4335		
652	3753	2	19M	·6923		
653	3754	3	19M	·9511		
654	3755	5	20M	·2098		
655	3756	6	20M	·4686		
656	3757	7	19M	·7273		
657	3758	1	19M	·9861		
658	3759	3	20M	·2448		
659	3760	4	20M	·5036		
660	3761	5	19M	·7623		
661	3762	7	20M	·0211		
662	3763	1	20M	·2799		
663	3764	2	20M	·5386		
664	3765	3	19M	·7974		
665	3766	5	20M	·0561		
666	3767	6	20M	·3149		
667	3768	7	20M	·5737		
668	3769	1	19M	·8324		
669	3770	3	20M	·0912		
670	3771	4	20M	·3499		
671	3772	5	20M	·6087		
672	3773	6	19M	·8674		
673	3774	1	20M	·1262		
674	3775	2	20M	·3850		
675	3776	3	20M	·6437		
676	3777	4	19M	·9025		
677	3778	6	20M	·1612		
678	3779	7	20M	·4200		
679	3780	1	20M	·6787		

for A.D. 500 to A.D. 999.

First new moon in solar year.	Anomaly of first new moon.	A.D.	Kaliyuga.	Week-day of 1st January.	Commencement of Indian solar year. Day.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	A.D.	Kaliyuga.	Week-day of 1st January.	Commencement of Indian solar year. Day.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.
19·6480	21·558	**680**	3781	2	19M	·9375	15·8189	27·347	**740**	3841	1	20M	·4629	11·9897	5·582
8·7563	17·715	**681**	3782	4	20M	·1962	4·9272	23·504	**741**	3842	3	20M	·7217	1·0980	1·739
27·3952	15·848	**682**	3783	5	20M	·4550	23·5661	21·638	**742**	3843	3	20M	·9804	19·7369	27·427
16·5035	12·006	**683**	3784	6	20M	·7138	12·6744	17·795	**743**	3844	5	21M	·2392	8·8452	23·584
5·6118	8·163	**684**	3785	7	19M	·9725	1·7827	13·952	**744**	3845	6	20M	·4979	27·4841	21·717
24·2507	6·296	**685**	3786	2	20M	·2313	20·4216	12·085	**745**	3846	7	20M	·7567	16·5924	17·875
13·3590	2·453	**686**	3787	3	20M	·4900	9·5299	8·242	**746**	3847	1	21M	·0154	5·7007	14·032
2·4673	26·165	**687**	3788	4	20M	·7488	28·1687	6·376	**747**	3848	3	21M	·2742	24·3396	12·165
21·1062	24·298	**688**	3789	5	20M	·0075	17·2770	2·533	**748**	3849	4	20M	·5330	13·4479	8·322
10·2145	20·456	**689**	3790	7	20M	·2663	6·3853	26·245	**749**	3850	5	20M	·7917	2·5562	4·480
28·8534	18·589	**690**	3791	1	20M	·5251	25·0242	24·378	**750**	3851	7	21M	·0505	21·1951	2·613
17·9617	14·746	**691**	3792	2	20M	·7838	14·1325	20·535	**751**	3852	1	21M	·3092	10·3034	26·325
7·0700	10·903	**692**	3793	4	20M	·0426	3·2408	16·693	**752**	3853	2	20M	·5680	28·9423	24·458
25·7088	9·037	**693**	3794	5	20M	·3013	21·8797	14·826	**753**	3854	3	20M	·8267	18·0506	20·615
14·8171	5·194	**694**	3795	6	20M	·5601	10·9808	10·983	**754**	3855	5	21M	·0855	7·1589	16·772
3·9254	1·351	**695**	3796	7	20M	·8188	0·0963	7·140	**755**	3856	6	21M	·3443	25·7978	14·906
22·5643	27·039	**696**	3797	2	20M	·0778	18·7852	5·274	**756**	3857	7	20M	·6030	14·9061	11·063
11·6726	23·196	**697**	3798	3	20M	·3364	7·8435	1·431	**757**	3858	1	20M	·8618	4·0144	7·220
0·7809	19·354	**698**	3799	4	20M	·5951	26·4824	27·119	**758**	3859	3	21M	·1205	22·6582	5·353
19·4198	17·497	**699**	3800	5	20M	·8539	15·5207	23·276	**759**	3860	4	21M	·3793	11·7815	1·511
8·5281	13·644	**700**	3801	7	20M	·1126	4·6990	19·433	**760**	3861	5	20M	·6380	0·8698	25·223
27·1670	11·777	**701**	3802	1	20M	3714	23·3379	17·567	**761**	3862	6	20M	·8968	19·5087	23·356
16·2753	7·935	**702**	3803	2	20M	·6301	12·4462	13·724	**762**	3863	1	21M	·1556	8·6170	19·513
5·3836	4·093	**703**	3804	3	20M	·8889	1·5545	9·881	**763**	3864	2	21M	·4143	27·2559	17·646
24·0225	2·225	**704**	3805	5	20M	·1477	20·1933	8·014	**764**	3865	3	20M	·6731	16·3642	13·804
13·1308	25·937	**705**	3806	6	20M	·4064	9·3016	4·172	**765**	3866	4	20M	·9318	5·4725	9·961
2·2391	22·094	**706**	3807	7	20M	·6652	27·9405	2·305	**766**	3867	6	21M	·1906	24·1114	8·094
20·8780	20·227	**707**	3808	1	20M	·9209	17·0488	26·017	**767**	3868	7	21M	·4493	13·2197	4·251
9·9863	16·384	**708**	3809	3	20M	·1827	6·1571	22·174	**768**	3869	1	20M	·7081	2·3280	0·409
28·6251	14·518	**709**	3810	4	20M	·4414	24·7960	20·307	**769**	3870	2	20M	·9668	20·9669	26·096
17·7334	10·675	**710**	3811	5	20M	·7002	13·9043	16·464	**770**	3871	4	21M	·2256	10·0752	22·254
6·8417	6·833	**711**	3812	6	20M	·9590	3·0126	12·622	**771**	3872	5	21M	·4844	28·7141	20·387
25·4806	4·966	**712**	3813	1	20M	·2177	21·6515	10·755	**772**	3873	6	20M	·7431	17·8224	16·544
14·5889	1·123	**713**	3814	2	20M	·4765	10·7598	6·912	**773**	3874	7	21M	·0019	6·9307	12·701
3·6972	24·835	**714**	3815	3	20M	·7352	29·3987	5·045	**774**	3875	2	21M	·2606	25·5698	10·835
22·3361	22·968	**715**	3816	4	20M	·9940	18·5070	1·203	**775**	3876	3	21M	·5194	14·6779	6·992
11·4444	19·125	**716**	3817	6	20M	·2527	7·6153	24·914	**776**	3877	4	20M	·7781	3·7862	3·149
0·5527	15·283	**717**	3818	7	20M	·5115	26·2542	23·048	**777**	3878	6	21M	·0369	22·4250	1·282
19·1916	13·416	**718**	3819	1	20M	·7703	15·3625	19·205	**778**	3879	7	21M	·2957	11·5333	24·994
8·2999	9·573	**719**	3820	3	21M	·0290	4·4708	15·362	**779**	3880	1	21M	·5544	0·6416	21 152
26·9388	7·706	**720**	3821	4	20M	·2878	23·1097	13·495	**780**	3881	2	20M	·8132	19·2805	19·284
16·0471	3·864	**721**	3822	5	20M	·5465	12·2180	9·653	**781**	3882	4	21M	·0719	8·3888	15·442
5·1554	0·021	**722**	3823	6	20M	·8053	1·3263	5·810	**782**	3883	5	21M	·3307	27·0277	13·575
23·7943	25·709	**723**	3824	1	21M	·0640	19·9651	3·943	**783**	3884	6	21M	·5894	16·1360	9·733
12·9026	21·866	**724**	3825	2	20M	·3228	9·0734	0·100	**784**	3885	7	20M	·8482	5·2443	5·890
2·0109	18·023	**725**	3826	3	20M	·5185	27·7123	25·788	**785**	3886	2	21M	·1070	23·8832	4·023
20·6498	16·156	**726**	3827	4	20M	·8403	16·8206	21·946	**786**	3887	3	21M	·3657	12·9915	0·180
9·7581	12·314	**727**	3828	6	21M	·0991	5·9289	18·103	**787**	3888	4	21M	·6245	2·0988	23·892
28·3969	10·447	**728**	3829	7	20M	·3578	24·5678	16·236	**788**	3889	5	20M	·8832	20·7387	22·025
17·5052	6·604	**729**	3830	1	20M	·6166	13·6761	12·393	**789**	3890	7	21M	·1420	9·8470	18·183
6·6135	2·761	**730**	3831	2	20M	·8753	2·7844	8·551	**790**	3891	1	21M	·4007	28·4859	16 316
25·2524	0·895	**731**	3832	4	21M	·1341	21·4233	6·674	**791**	3892	2	21M	·6595	17·5942	12·473
14·3607	24·606	**732**	3833	5	20M	·3928	10·5316	2·841	**792**	3893	3	20M	·9183	6·7025	8·630
3·4690	20·764	**733**	3834	6	20M	·6516	29·1705	0·974	**793**	3894	5	21M	·1770	25·3413	6·764
22·1079	18·897	**734**	3835	7	20M	·9104	18·2788	24·686	**794**	3895	6	21M	·4358	14·4496	2·921
11·2162	15·054	**735**	3836	2	21M	·1691	7·3871	20·843	**795**	3896	7	21M	·6945	3·5579	26·633
0·3245	11·212	**736**	3837	3	20M	·4279	26·0260	18·976	**796**	3897	1	20M	·9533	22·1968	24·766
18·9634	9·345	**737**	3838	4	20M	·6866	15·1343	15·134	**797**	3898	3	21M	·2120	11·3051	20·923
8·0717	5·502	**738**	3839	5	20M	·9454	4·2426	11·291	**798**	3899	4	21M	·4708	0·4134	17·080
26·7106	3·635	**739**	3840	7	21M	·2041	22·8815	9·424	**799**	3900	5	21M	·7296	19·0523	15·214

TABLE II.—Sūrya siddhānta figures

A.D.	Kaliyuga.	Week-day of 1st January.	Commencement of Indian solar year. Day.	Commencement of Indian solar year. Fraction of day.	First new moon in solar year.	Anomaly of first new moon.
800	3901	6	20M	·9883	8·1606	11·371
801	3902	1	21M	·2471	26·7995	9·504
802	3903	2	21M	·5058	15·9078	5·661
803	3904	3	21M	·7646	5·0161	1·819
804	3905	5	21M	·0233	23·6550	27·507
805	3906	6	21M	·2821	12·7633	23·664
806	3907	7	21M	·5409	1·8716	19·821
807	3908	1	21M	·7996	20·5105	17·954
808	3909	3	21M	·0584	9·6188	14·112
809	3910	4	21M	·3171	28·2577	12·245
810	3911	5	21M	·5759	17·3660	8·402
811	3912	6	21M	·8346	6·4743	4·559
812	3913	1	21M	·0934	25·1131	2·693
813	3914	2	21M	·3522	14·2214	26·404
814	3915	3	21M	·6109	3·3297	22·562
815	3916	4	21M	·8697	21·9686	20·695
816	3917	6	21M	·1284	11·0769	16·852
817	3918	7	21M	·3872	0·1852	13·009
818	3919	1	21M	·6459	18·8241	11·143
819	3920	2	21M	·9047	7·9324	7·300
820	3921	4	21M	·1634	28·5713	5·433
821	3922	5	21M	·4222	15·6796	1·590
822	3923	6	21M	·6810	4·7879	25·302
823	3924	7	21M	·9397	23·4268	23·435
824	3925	2	21M	·1985	12·5351	19·593
825	3926	3	21M	·4572	1·6434	15·750
826	3927	4	21M	·7160	20·2823	13·883
827	3928	5	21M	·9747	9·3906	10·040
828	3929	7	21M	·2335	28·0295	8·174
829	3930	1	21M	·4923	17·1378	4·331
830	3931	2	21M	·7510	6·2461	0·488
831	3932	3	22M	·0098	24·8849	26·176
832	3933	5	21M	·2685	13·9932	22·333
833	3934	6	21M	·5273	3·1015	18·491
834	3935	7	21M	·7860	21·7404	16·624
835	3936	2	22M	0448	10·8487	12·781
836	3937	3	21M	·3036	29·4876	10·914
837	3938	4	21M	·5623	18·5959	7·072
838	3939	5	21M	·8211	7·7042	3·229
839	3940	7	22M	·0798	26·8431	1·362
840	3941	1	21M	·3386	15·4514	25·074
841	3942	2	21M	·5973	4·5597	21·231
842	3943	3	21M	·8561	23·1986	19·364
843	3944	5	22M	·1149	12·3069	15·522
844	3945	6	21M	·3736	1·4152	11·679
845	3946	7	21M	·6324	20·0541	9·812
846	3947	1	21M	·8911	9·1624	5·969
847	3948	3	22M	·1499	27·8012	4·103
848	3949	4	21M	·4086	16·9095	0·260
849	3950	5	21M	·6674	6·0178	23·972
850	3951	6	21M	·9262	24·6567	22·105
851	3952	1	22M	·1849	13·7650	18·262
852	3953	2	21M	·4437	2·8733	14·419
853	3954	3	21M	·7024	21·5122	12·552
854	3955	4	21M	·9612	10·6205	8·170
855	3956	6	22M	·2199	29·2594	6·843
856	3957	7	21M	·4787	18·3677	3·000
857	3958	1	21M	·7375	7·4760	26·712
858	3959	2	21M	·9962	26·1149	24·845
859	3960	4	22M	·2550	15·2232	21·003
860	3961	5	21M	·5137	4·3315	17·160
861	3962	6	21M	·7725	22·9704	15·293
862	3963	1	22M	·0312	12·0787	11·450
863	3964	2	22M	·2900	1·1870	7·608
864	3965	3	21M	·5487	19·8259	5·741
865	3966	4	21M	·8075	8·9342	1·898
866	3967	6	22M	·0663	27·5730	0·031
867	3968	7	22M	·3250	16·6813	23·744
868	3969	1	21M	·5838	5·7896	19·901
869	3970	2	21M	·8425	24·4285	18·034
870	3971	4	22M	·1013	3·5368	14·191
871	3972	5	22M	3600	2·6451	10·348
872	3973	6	21M	·6188	21·2840	8·481
873	3974	7	21M	·8776	10·3923	4·639
874	3975	2	22M	·1363	29·0312	2·772
875	3976	3	22M	·3951	18·1895	26·484
876	3977	4	21M	·6538	7·2478	22·641
877	3978	5	21M	·9126	25·8867	20·774
878	3979	7	22M	·1713	14·9950	16·932
879	3980	1	22M	·4301	4·1038	13·089
880	3981	2	21M	·6889		
881	3982	3	21M	·9476		
882	3983	5	22M	·2064		
883	3984	6	22M	·4651		
884	3985	7	21M	·7239		
885	3986	1	21M	·9826		
886	3987	3	22M	·2414		
887	3988	4	22M	·5002		
888	3989	5	21M	·7589		
889	3990	6	22M	·0177		
890	3991	1	22M	·2764		
891	3992	2	22M	·5352		
892	3993	3	21M	·7939		
893	3994	5	22M	·0527		
894	3995	6	22M	·3115		
895	3996	7	22M	·5702		
896	3997	1	21M	·8290		
897	3998	3	22M	·0877		
898	3999	4	22M	·3465		
899	4000	5	22M	6052		
900	4001	6	21M	·8640		
901	4002	1	22M	·1228		
902	4003	2	22M	·3815		
903	4004	3	22M	·6403		
904	4005	4	21M	·8990		
905	4006	6	22M	·1578		
906	4007	7	22M	·4165		
907	4008	1	22M	·6753		
908	4009	2	21M	·9341		
909	4010	4	22M	·1928		
910	4011	5	22M	·4516		
911	4012	6	22M	·7103		
912	4013	7	21M	·9691		
913	4014	2	22M	·2278		
914	4015	3	22M	·4866		
915	4016	4	22M	·7453		
916	4017	5	21M	·0041		
917	4018	7	22M	·2629		
918	4019	1	22M	·5216		
919	4020	2	22M	·7804		

for A.D. 500 to A.D. 999—*cont.*

First new moon in solar year.	Anomaly of first new moon.	A.D.	Kaliyuga.	Week-day of 1st January.	Commencement of Indian solar year. Day.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.	A.D.	Kaliyuga.	Week-day of 1st January.	Commencement of Indian solar year. Day.	Fraction of day.	First new moon in solar year.	Anomaly of first new moon.
22·7422	11·222	**920**	4021	4	22M	·0391	0·5024	22·949	**960**	4061	5	22M	·3894	7·7981	9·098
11·8505	7·379	**921**	4022	5	22M	·2979	19·1412	21·083	**961**	4062	6	22M	·6482	26·4320	7·231
0·9588	3·537	**922**	4023	6	22M	·5566	8·2495	17·240	**962**	4063	7	22M	·9069	15·5403	3·388
19·5977	1·670	**923**	4024	7	22M	·8154	26·8884	15·373	**963**	4064	2	23M	·1657	4·6486	27·100
8·7060	27·382	**924**	4025	2	22M	·0742	15·9967	11·530	**964**	4065	3	22M	·4244	23·2875	25·233
27·3448	23·515	**925**	4026	3	22M	·3329	5·1050	7·688	**365**	4066	4	22M	·6832	12·3958	21·391
16·4531	19·672	**926**	4027	4	22M	·5917	23·7439	5·828	**966**	4067	5	22M	·9419	1·5041	17·548
5·5614	15·829	**927**	4028	5	22M	·8504	12·8522	1·978	**967**	4068	7	23M	·2007	20·1430	15·681
24·2003	13·963	**928**	4029	7	22M	·1092	1·9605	25·690	**968**	4069	1	22M	·4595	9·2513	11·838
13·3086	10·120	**929**	4030	1	22M	·3679	20·5994	23·823	**969**	4070	2	22M	·7182	27·8902	9·972
2·4169	6·277	**930**	4031	2	22M	·6267	9·7077	19·980	**970**	4071	3	22M	·9770	16·9985	6·129
21·0558	4·410	**931**	4032	3	22M	·8855	28·3466	18·114	**971**	4072	5	23M	·2357	6·1068	2·286
10·1641	0·568	**932**	4032	5	22M	·1442	17·4549	14·271	**972**	4073	6	22M	·4945	24·7457	0·419
28·8030	26·256	**933**	4034	6	22M	·4020	6·5632	10·428	**973**	4074	7	22M	·7532	13·8540	24·131
17·9113	22·413	**934**	4035	7	22M	·6617	25·2021	8·561	**974**	4075	1	23M	·0120	2·9623	20·288
7·0196	18·570	**935**	4036	1	22M	·9205	14·3104	4·719	**975**	4076	3	23M	·2708	21·6011	18·422
25·6585	16·703	**936**	4037	3	22M	·1792	3·4187	0·876	**976**	4077	4	22M	·6295	10·7094	14·579
14·7668	12·861	**937**	4038	4	22M	·4380	22·0575	26·564	**977**	4078	5	22M	·7883	29·3483	13·712
3·8751	9·018	**938**	4039	5	22M	·6968	11·1658	22·721	**978**	4079	7	23M	·0470	18·4566	8·869
22·5140	7·151	**939**	4040	6	22M	·9555	0·2741	18·878	**979**	4080	1	23M	·3058	7·5649	5·030
11·6220	3·309	**940**	4041	1	22M	·2143	18·9130	17·011	**980**	4081	2	22M	·5645	26·2038	3·160
0·7306	27·021	**941**	4042	2	22M	·4730	8·0213	13·169	**981**	4082	3	22M	·8233	15·3131	26·872
19·8694	25·154	**942**	4043	3	22M	·7318	26·6602	13 299	**982**	4083	5	23M	·0821	4·4204	23·029
8·4777	21·311	**943**	4044	4	22M	·9904	15·7685	7·459	**983**	4084	6	23M	·3408	23·0593	21·162
27·1166	19·444	**944**	4045	5	22M	·2493	4·8768	3·617	**984**	4085	7	22M	·5996	12·1676	17·319
16·2249	15·602	**945**	4046	7	22M	·5081	23·5157	1·750	**985**	4086	1	22M	·8583	1·2759	13·477
5·3332	11·752	**946**	4047	1	22M	·7668	12·6240	25·463	**986**	4087	3	23M	·1171	19·9148	11·610
23·9721	9·892	**947**	4048	2	22M	·0256	1·7328	21·612	**987**	4088	4	23M	·3578	9·0231	7·767
13·0804	6·049	**948**	4049	4	22M	·2843	20·3712	19·752	**988**	4089	5	22M	·6346	27·6620	5·900
2·1887	2·207	**949**	4050	5	22M	·5431	9·4795	15·909	**989**	4090	6	22M	·8994	16·7703	2·058
20·8276	0·340	**950**	4051	6	22M	·8018	28·1184	14·043	**990**	4091	1	23M	·1521	5·8786	25·769
9·9359	24·052	**951**	4052	1	23M	·0606	17·2267	10·200	**991**	4092	2	23M	·4109	24·5174	23·903
28·5748	22·185	**952**	4053	2	22M	·3194	6·3350	6·357	**992**	4093	3	22M	·6696	13·6257	20·060
17·6831	18·342	**953**	4054	3	22M	·5781	24·9739	4·490	**993**	4094	4	22M	·9284	2·7340	16·217
6·7914	14·499	**954**	4055	4	22M	·8369	14·0822	0·648	**994**	4095	6	23M	·1871	21·3729	14·350
25·4303	12·633	**955**	4056	6	23M	·0956	3·1905	24·359	**995**	4096	7	23M	·4459	10·4812	10·508
14·5386	8·790	**956**	4057	7	22M	·3544	21·8293	22·498	**996**	4097	1	22M	·7047	29·1201	8·641
3·6469	4·947	**957**	4058	1	22M	·6131	10·9376	18·650	**997**	4098	2	22M	·9734	18·2284	4·798
22·2858	3·080	**958**	4059	2	22M	·8719	0 0459	14·807	**998**	4099	4	23M	·2222	7·3867	0·955
11·3941	26·792	**959**	4060	4	23M	·1306	18·6848	12·940	**999**	4100	5	23M	·4809	25·9756	26·643

TABLE II.—

Kaliyuga.	Vikrama era.	Śaka era.	Commencement of solar year. Month and day A.D.	Fraction of day.	First new moon in solar year	Anomaly of first new moon.	A.D.	Vaiśākha. Week-day.	Month.	Day.	Fraction.	Jyeshṭha. Week-day.	Month.	Day.	Fraction.	Āshāḍha. Week-day.	Month.	Day.	Fraction.	Śrāvaṇa. Week-day.	Month.	Day.	Fraction.	Bhādrapdaa. Week-day.	Month.	Day.	Fraction.
4101	1057	922	22M	·7396	15·0839	22·801	**1000**	7	Ap	6●	·82	2	My	6	·35	3	Je	4	·88	5	Jl	4	·41	6	Au	2	·95
4102	1058	923	22M	·9983	4·1922	18·959	**1001**	5	Mr	27	·19	6	Ap	25	·72	1 / 2	My / Je	25 / 23	·25 / ·78	4	Jl	28	·31	5	Au	21○	·84
4103	1059	924	23M	·2571	22·8311	17·091	**1002**	4	Ap	15	·09	5	My	14	·62	7	Je	13	·15	1	Jl	12	·68	3	Au	11●○	·21
4104	1060	925	23M	·5158	11·9394	13·249	**1003**	1	Ap	4	·45	2	My	3	·99	4	Je	2	·52	6	Jl	2	·05	7	Jl	31○	·58
4105	1061	926	22M	·7746	1·0477	9·406	**1004**	5 / 7	Mr / Ap	23 / 22	·82 / ·35	1	My	21	·88	3	Je	20○	·41	4	Jl	19●	·94	6	Au	18	·47
4106	1062	927	23M	·0334	19·6866	7·539	**1005**	4	Ap	11	·72	6	My	11	·25	7	Je	9○	·78	2	Jl	9	·31	3	Au	7	·84
4107	1063	928	23M	·2921	8·7949	3·696	**1006**	2	Ap	1	·09	3	Ap	30	·62	5	My	30○	·15	6	Je	28	·68	1 / 2	Jl / Au	28 / 26	·21 / ·74
4108	1064	929	23M	·5509	27·4338	1·830	**1007**	7	Ap	19	·98	2	My	19●	·51	4	Je	18	·05	5	Jl	17	·58	7	Au	16	·11
4109	1065	930	22M	·8096	16·5421	25·542	**1008**	5	Ap	8○	·35	6	My	7	·88	1	Je	6	·41	2	Jl	5	·94	4	Au	4	·47
4110	1066	931	23M	·0684	5·6504	21·699	**1009**	2	Mr	28○	·72	4	Ap	27	·25	5	My	26	·78	7 / 1	Je / Jl	25 / 24	·31 / ·84	3	Au	23	·37
4111	1067	932	23M	·3271	24·2892	19·832	**1010**	1	Ap	16	·62	3	My	16	·15	4	Je	14	·68	6	Jl	14	·21	7	Au	12	·74
4112	1068	933	23M	·5859	13·3975	15·989	**1011**	5	Ap	5	·98	7	My	5	·51	2	Je	4	·04	3	Jl	3	·57	5	Au	2	·11
4113	1069	934	22M	·8446	2·5058	12·147	**1012**	3	Mr	25	·35	4 / 6	Ap / My	23 / 23	·88 / ·41	7	Je	21	·94	2	Jl	21○	·47	4	Au	20●	·00
4114	1070	935	23M	·1034	21·1447	10·280	**1013**	2	Ap	13	·25	3	My	12	·78	5	Je	11	·31	6	Jl	10○	·84	1	Au	9	·37
4115	1071	936	23M	·3822	10·2530	6·437	**1014**	6	Ap	2	·61	1	My	2	·15	2	My	31	·68	4	Je	30●○	·21	5	Jl	29	·74
4116	1072	937	23M	·6209	28·8919	4·570	**1015**	5	Ap	21	·51	7	My	21○	·04	1	Je	19●	·57	3	Jl	19	·10	4	Au	17	·63
4117	1073	938	22M	·8797	18·0002	0·727	**1016**	2	Ap	9	·88	4	My	9○	·41	5	Je	7	·94	7	Jl	7	·47	2	Au	6	·00
4118	1074	939	23M	·1394	7·1085	24·439	**1017**	7	Mr	30	·25	1	Ap	28○	·78	3	My	28	·31	4 / 6	Je / Jl	26 / 26	·84 / ·37	7	Au	24	·90
4119	1075	940	23M	·3972	25·7474	22·573	**1018**	6	Ap	18	·14	7	My	17	·67	2	Je	16	·21	3	Jl	15	·74	5	Au	14	·27
4120	1076	941	23M	·6559	14·8557	18·730	**1019**	3	Ap	7●	·51	5	My	7	·04	6	Je	5	57	1	Jl	5	·10	2	Au	3	·63
4121	1077	942	22M	·9147	8·9640	14·887	**1020**	7	Mr	26	·88	2	Ap	25	·41	3 / 5	My / Je	24 / 23	·94 / ·47	7	Jl	23	·00	1	Au	21○	·53
4122	1078	943	23M	·1735	22·6029	13·020	**1021**	6	Ap	14	·78	1	My	14	·31	2	Je	12	·84	4	Jl	12	·37	5	Au	10●○	·90
4123	1079	944	23M	·4322	11·7112	9·178	**1022**	4	Ap	4	·14	5	My	3	·67	7	Je	2	·20	1	Jl	1○	·73	3	Jl	31	·27
4124	1080	945	23M	·6910	0·8195	5·384	**1023**	1 / 3	Mr / Ap	24 / 23	·51 / ·04	4	My	22	·57	6	Je	21○	·10	7	Jl	20	·63	2	Au	19	·16
4125	1081	946	22M	·9497	19·4584	3·468	**1024**	7	Ap	11	·41	1	My	10	·94	3	Je	9●○	·47	5	Jl	9	·00	6	Au	7	·53
4126	1082	947	23M	·2085	8·5867	27·180	**1025**	4	Mr	31	·77	6	Ap	30	·31	7	My	29	·84	2	Je	28	·37	3 / 5	Jl / Au	27 / 26	·90 / ·43
4127	1083	948	23M	·4672	27·2056	25·313	**1026**	3	Ap	19○	·67	5	My	19●	·20	6	Je	17	·73	1	Jl	17	·26	2	Au	15	·79
4128	1084	949	23M	·7260	16·3139	21·470	**1027**	1	Ap	9○	·04	2	My	8	·57	4	Je	7	·10	5	Jl	6	·63	7	Au	5	·16
4129	1085	950	22M	·9848	5·4232	17·628	**1028**	5	Mr	28○	·41	6	Ap	26	·94	1	My	26	·47	3 / 4	Je / Jl	25 / 24	·00 / ·53	6	Au	23	·06
4130	1086	951	23M	·2485	24·0610	15·761	**1029**	4	Ap	16	·30	5	My	15	·83	7	Je	14	·37	1	Jl	13	·90	3	Au	12	·43
4131	1087	952	23M	·5023	13·1693	11·918	**1030**	1	Ap	5	·67	8	My	5	·20	4	Je	3	·78	6	Jl	3	·26	7	Au	1○	·79
4132	1088	953	23M	·7610	2·2776	8·075	**1031**	6	Mr	26	·04	7 / 2	Ap / My	24 / 24	·57 / ·10	3	Je	22	·63	5	Jl	22○	·16	6	Au	20	·69
4133	1089	954	23M	·0198	20·9165	6·209	**1032**	4	Ap	12	·94	6	My	12	·47	1	Je	11	·00	2	Jl	10●○	·53	4	Au	9	·06
4134	1090	955	23M	·2785	10·0218	2·866	**1033**	2	Ap	2	·30	3	My	1	·83	5	My	31○	·36	6	Je	29●	·89	1	Jl	29	·43
4135	1091	956	23M	·5873	28·6637	0·499	**1034**	1	Ap	21	·20	2	My	20○	·78	4	Je	19●	·26	5	Jl	18	·79	7	Au	17	·32
4136	1092	957	23M	·7960	17·7720	24·211	**1035**	5	Ap	10	·57	7	My	10●○	·10	1	Je	8	·63	3	Jl	8	·16	4	Au	6	·69
4137	1093	958	23M	·0548	6·8803	20·368	**1036**	2	Mr	29	·93	4	Ap	28●	·47	6	My	28	·00	7 / 2	Je / Jl	26 / 26	·53 / ·06	3	Au	24	·59
4138	1094	959	23M	·3136	25·5192	18·501	**1037**	1	Ap	17	·83	3	My	17	·36	4	Je	15	·89	6	Jl	15	·42	7	Au	13	·95
4139	1095	960	23M	·5723	14·6275	14·659	**1038**	6	Ap	7	·20	7	My	6	·73	2	Je	5	·26	3	Jl	4	·79	5	Au	3	·32
4140	1096	961	23M	·8311	3·7358	10·816	**1039**	3	Mr	27	·57	5	Ap	26	·10	6 / 1	My / Je	25 / 24	·63 / ·16	2	Jl	23	·69	4	Au	22●○	·22
4141	1097	962	23M	·0898	22·3747	8·949	**1040**	2	Ap	14	·46	3	My	13	·99	5	Je	12	·53	7	Jl	12	·06	1	Au	10	·59
4142	1098	963	23M	·3486	11·4830	5·106	**1041**	6	Ap	3	·83	1	My	3	·36	2	Je	1	·89	4	Jl	1○	·42	5	Jl	30	·95
4143	1099	964	23M	·6073	0·5913	1·264	**1042**	4 / 5	Mr / Ap	24 / 22	·20 / ·73	7	My	22	·26	1	Je	20●○	·79	3	Jl	20	·32	4	Au	18	·85
4144	1100	965	23M	·8661	19·2302	26·952	**1043**	3	Ap	12	·10	4	My	11	·63	6	Je	10●	·16	7	Jl	9	·69	2	Au	8	·22
4145	1101	966	23M	·1249	8·3385	23·109	**1044**	7	Mr	31	·46	1	Ap	29○	·99	3	My	29	·52	5	Je	28	·05	6 / 1	Jl / Au	27 / 26	·59 / ·12
4146	1102	967	22M	·3836	26·9773	21·242	**1045**	6	Ap	19●○	·36	7	My	18	·89	2	Je	17	·42	3	Jl	16	·95	5	Au	15	·48
4147	1103	968	23M	·6424	16·0856	17·399	**1046**	3	Ap	8●○	·73	5	My	8	·26	6	Je	6	·79	1	Jl	6	·32	2	Au	4	·85
4148	1104	969	23M	·9011	5·1939	13·557	**1047**	1	Mr	29●	·09	2	Ap	27	·63	4	My	27	·16	5 / 7	Je / Jl	25 / 25	·69 / ·22	1	Au	23	·75
4149	1105	970	23M	·1599	23·8328	11·690	**1048**	6	Ap	15	·99	1	My	15	·52	3	Je	14	·05	4	Jl	13	·58	6	Au	12○	·11
4150	1106	971	23M	·4186	12·9411	7·847	**1049**	4	Ap	5	·36	5	My	4	·89	7	Je	3	·42	1	Jl	2	·95	3	Au	1○	·48
4151	1107	972	23M	·6774	2·0494	4·004	**1050**	1	Mr	25	·73	3 / 4	Ap / My	24 / 23	·26 / ·79	6	Je	22	·32	7	Jl	21○	·85	2	Au	20	·38
4152	1108	973	23M	·9362	20·6883	2·138	**1051**	7	Ap	13	·62	2	My	13	·15	3	Je	11○	·69	5	Jl	11	·22	6	Au	9	·75
4153	1109	974	23M	·1949	9·7966	25·849	**1052**	4	Ap	1	·99	6	My	1	·52	1	My	31○	·05	2	Je	29	·58	4	Jl	29	·11

N.B.—For tithis by other siddhāntas, add algebraically to

Sūrya siddhānta.

	Āśvina.			Kārttika.			Mārgaśirsha.			Fausha.		A.D.	Māgha.		A.D.	Phālguna.			Chaitra.		
	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.		Week-day.	Month.	Day.	Fraction.
	1	S	1	·48	3	O	1●	·01	4	O	30	·54		6	N	29	·07		7	D	28	·60
	7	S	20●	·37	1	O	19	·90	3	N	18	·43		4	D	17	·97	02	6	Jr	16	·50
	4	S	9	·74	6	O	9	·27	7	N	7	·80		2	D	7	·33	03	3	Jr	5	·86
	2	Au	30	·11	3	S	28	·64	5	O	28	·17		6	N	26	·70		1	D	26	·23
	1	S	17	·01	2	O	16	·54	4	N	15	·07		5	D	14○	·60	05	7	Jr	13●	·13
	5	S	6	·37	6	O	5	·90	1	N	4	·43		2	D	3○	·96	06	4	Jr	2	·49
	4	S	25	·27	5	O	24	·80	7	N	23○	·33		1	D	22	·86	07	3	Jr	21	·39
	1	S	14	·64	3	O	14	·17	4	N	12	·70		6	D	12	·23	08	7	Jr	10	·76
	6	S	3	·00	7	O	2○	·53	2	N	1	·07		3	N	30	·60		5	D	30	·13
	4	S	21○	·90	6	O	21	·43	7	N	19	·96		2	D	19	·49	10	4	Jr	18	·02
	2	S	11○	·27	3	O	10	·80	5	N	9	·33		6	D	8	·86	11	1	Jr	7	·39
	6	Au	31	·64	1	S	30	·17	2	O	29	·70		4	N	28	·23		5	D	27	·76
	5	S	18	·53	7	O	18	·66	1	N	16	·59		3	D	16	·18	13	4	Jr	14○	·66
	2	S	7	·90	4	O	7	·43	5	N	5	·96		7	D	5	·49	14	2	Jr	4●	·02
	7	Au	26	·27	1	S	26	·80	3	O	26	·83		4	N	24	·86		6	D	24	·39
	6	S	16	·17	7	O	15	·70	2	N	14○	·23		3	D	13	·76	16	5	Jr	12	·29
	3	S	4	·53	5	O	4	·06	6	N	2○	·59		1	D	2	·12		2	D	31	·65
	2	S	23	·43	3	O	22○	·96	5	N	21	·49		7	D	21	·02	18	1	Jr	19	·55
	6	S	12	·83	1	O	12	·33	2	N	10	·86		4	D	10	·39	19	5	Jr	8	·92
	4	S	2○	·16	5	O	1	·69	7	O	31	·23		1	N	29	·76		3	D	29	·29
	3	S	20	·06	4	O	19	·59	6	N	18	·12		7	D	17	·65	21	2	Jr	16	·18
	7	S	9	·43	1	O	8	·96	3	N	7	·49		5	D	7	·02	22	6	Jr	5	·55
	4	Au	29	·80	6	S	28	·33	7	O	27	·86		2	N	26	·39		3	D	25○	·92
	3	S	17	·69	5	O	17	·22	6	N	15	·75		1	D	15○	·29	24	2	Jr	13	·82
	1	S	6	·06	2	O	5	·59	4	N	4	·12		5	D	3●○	·65	25	7	Jr	2	·18
	6	S	24	·96	1	O	24	·49	3	N	23●	·02		4	D	22	·55	26	6	Jr	21	·08
	4	S	14	·33	5	O	13○	·86	7	N	12●	·39		1	D	11	·92	27	3	Jr	10	·45
	1	S	3	·69	3	O	3○	·22	4	N	1●	·75		6	D	1	·28		7	D	30	·81
	7	S	21●○	·59	2	O	21	·12	3	N	19	·65		5	D	19	·18	29	6	Jr	17	·71
	4	S	10●	·96	6	O	10	·49	1	N	9	·02		2	D	8	·55	30	4	Jr	7	·08
	2	Au	31	·32	3	S	29	·85	5	O	29	·39		6	N	27	·92		1	D	27	·45
	1	S	19	·22	2	O	18	·75	4	N	17	·28		5	D	16	·81	32	7	Jr	15●	·34
	5	S	7	·59	7	O	7	·12	1	N	5	·65		3	D	5	·18	33	4	Jr	3●	·71
	2	Au	27	·96	4	S	26	·49	6	O	26	·02		7	N	24○	·55		2	D	24	·08
	1	S	15	·85	3	O	15	·38	4	N	13○	·91		6	D	13	·45	35	7	Jr	11	·98
	6	S	5	·22	7	O	4	·75	2	N	3○	·28		3	D	2	·81	36	5	Jr	1	·34
	5	S	23	·12	6	O	22●	·65	1	N	21	·18		2	D	20	·71	37	4	Jr	19	·24
	2	S	12○	·49	4	O	12	·02	5	N	10	·55		7	D	10	·08	38	1	Jr	8	·61
	6	S	1○	·85	1	O	1	·38	2	O	30	·91		4	N	29	·44		5	D	28	·97
	5	S	20	·75	7	O	20	·28	1	N	18	·81		3	D	18	·34	40	4	Jr	16	·87
	3	S	9	·12	4	O	8	·65	6	N	7	·18		7	D	6	·71	41	2	Jr	5○	·24
	7	Au	29	·48	2	S	28	·01	3	O	27	·55		5	N	26	·08		6	D	25○	·61
	6	S	17	·38	7	O	16	·91	2	N	15	·44		3	D	14●○	·97	43	5	Jr	13	·50
	3	S	6	·75	5	O	6	·28	6	N	4	·81		1	D	4●	·34	44	2	Jr	2	·87
	2	S	24	·65	4	O	24○	·18	5	N	22●	·71		7	D	22	·24	45	1	Jr	20	·77
	7	S	14	·01	1	O	13○	·54	3	N	12	·07		4	D	11	·61	46	6	Jr	10	·14
	4	S	3	·38	5	O	2○	·91	7	N	1	·44		1	N	30	·97		3	D	30	·50
	3	S	22●	·28	4	O	21	·81	6	N	20	·34		7	D	19	·87	48	2	Jr	18	·40
	7	S	10	·65	2	O	10	·18	3	N	8	·71		5	D	8	·24	49	6	Jr	6	·77
	5	Au	31	·01	6	S	29	·54	1	O	29	·07		2	N	27	·60		4	D	27	·13
	3	S	18	·91	5	O	18	·44	6	N	16	·97		1	D	16	·50	51	3	Jr	15●	·03
	1	S	8	·28	2	O	7	·81	4	N	6	·34		5	D	5○	·87	52	7	Jr	4	·40
	5	Au	27	·64	1	O	25	·71	3	N	24●○	·24							4	D	23	·77
	7	S	26	·17																		

Pausha Kshaya

01	2	Jr	27	·13	3	F	25○	·66														
	1	F	15○	·03	2	Mr	16	·56														
	5	F	4○	·39	6	Mr	5	·92														
04	2	Jr	24	·76	4	F	23	·29														
	1	F	11	·66	3	Mr	13	·19														
	6	F	1	·03	7	Mr	2	·56														
	4	F	19	·92	6	Mr	21	·45														
	2	F	9	·29	3	Mr	9	·82														
09	6	Jr	28	·66	1	F	27	·19														
	5	F	16	·55	7	Mr	18○	·09														
	2	F	5	·92	4	Mr	7	·45														
12	7	Jr	26○	·29	1	F	24	·82														
	6	F	13	·19	7	Mr	14	·72														
	3	F	2	·55	5	Mr	4	·08														
15	7	Jr	22	·92	2	F	21	·45														
					3	Mr	22	·98														
	6	F	10	·82	1	Mr	11	·85														
17	4	Jr	30	·19	5	F	28	·72														
	3	F	18	·08	4	Mr	19	·61														
	7	F	7	·45	1	Mr	8○	·98														
20	4	Jr	27	·82	6	F	26○	·35														
	3	F	14○	·71	5	Mr	16	·25														
	1	F	4	·08	2	Mr	5	·61														
23	5	Jr	24	·45	6	F	22	·98														
	4	F	12	·35	5	Mr	12	·88														
	1	Jr	31	·71	3	Mr	2	·24														
	7	F	19	·61	2	Mr	21	·14														
	4	F	8	·98	6	Mr	10	·51														
28	2	Jr	29	·35	3	F	27	·88														
	1	F	16	·24	2	Mr	17	·77														
	5	F	5○	·61	7	Mr	7	·14														
31	2	Jr	25○	·98	4	F	24	·51														
	1	F	13	·87	3	Mr	14	·41														
	6	F	2	·24	7	Mr	3	·77														
34	3	Jr	22	·61	5	F	21	·14														
					6	Mr	22	·67														
	2	F	10	·51	4	Mr	12	·04														
	6	Jr	30	·87	1	F	29	·40														
	5	F	17	·77	7	Mr	19○	·30														
	3	F	7	·14	4	Mr	8○	·67														
39	7	Jr	27	·51	2	F	26○	·04														
	6	F	15●	·40	7	Mr	15	·93														
	3	F	3	·77	5	Mr	5	·30														
42	1	Jr	24	·14	2	F	22	·67														
	7	F	12	·03	1	Mr	13	·57														
	4	F	1	·40	5	Mr	21	·93														
	3	F	19	·30	4	Mr	20	·83														
	7	F	8	·67	2	Mr	10	·20														
47	5	Jr	29	·03	6	F	27	·56														
	3	F	16○	·93	5	Mr	17●	·46														
	1	F	5●○	·30	2	Mr	6	·83														
50	5	Jr	25	·67	7	F	24	·20														
	4	F	13	·56	6	Mr	15	·09														
	1	F	2	·93	3	Mr	3	·46														
53	6	Jr	22	·30	7	F	20	·83														
					2	Mr	22	·36														

the above + ·01 for Ārya siddhānta and — ·05 for Brahma siddhānta.

TABLE II.—NEW MOONS AND ECLIPSES

TABLE II.—

Kaliyuga.	Vikrama era.	Śaka era.	Month and day A.D.	Fraction of day.	Commencement of solar year.	First new moon in solar year.	Anomaly of first new-moon.	Christian era.	Vaiśākha.			Jyeshṭha.			Āshāḍha.			Śrāvaṇa.			Bhādrapada.		
									Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
								A.D																
4154	1110	975	23M	·4537	28·4355	23·983		1053	3 Ap	20	·89	5 My	20○	·42	6 Je	18	·95	1 Jl	18	·48	3 Au	17	·01
4155	1111	976	23M	.7124	17·5438	20·140		1054	1 Ap	10	·26	2 My	9●	·79	4 Je	8	·32	5 Jl	7	·85	7 Au	6	·38
4156	1112	977	23M	·9711	6·6521	16·297		1055	5 Mr	30○	·62	7 Ap	29	·15	1 My	28	·68	3 Je 4 Jl	27 26	·21 ·75	6 Au	25	·28
4157	1113	978	23M	·2299	25·2910	14·430		1056	4 Ap	17	·52	6 My	17	·05	7 Je	15	·58	2 Jl	15	·11	3 Au	13	·64
4158	1114	979	23M	·4887	14·3998	10·588		1057	1 Ap	6	·89	3 My	6	·42	4 Je	4	·95	6 Jl	4	·48	1 Au	3	·01
4159	1115	980	23M	·7474	3·5076	6·745		1058	6 Mr	27	·25	7 Ap 2 My	25 25	·79 ·32	3 Je	23	·85	5 Jl	23	·38	6 Au	21●	·91
4160	1116	981	24M	·0062	22·1465	4·878		1059	5 Ap	15	·15	6 My	14	·68	1 Je	13	·21	2 Jl	12○	·74	4 Au	11●	·27
4161	1117	982	23M	·2650	11·2548	1·035		1060	2 Ap	3	·52	4 My	3	·05	5 Je	1	·58	7 Jl	1○	·11	1 Jl	30	·64
4163	1118	983	23M	·5237	0·3631	24·747		1061	6 Mr 1 Ap	23 22	·89 ·42	2 My	21	·95	4 Je	20●	·48	6 Jl	20	·01	7 Au	18	·54
4163	1119	984	23M	·7825	19·0020	22·880		1062	5 Ap	11	·78	7 My	11○	·31	1 Je	9	·85	3 Jl	9	·38	4 Au	7	·91
4164	1120	985	24M	·0412	8·1103	19·038		1063	3 Ap	1	·15	4 Ap	30○	·68	6 My	30	·21	7 Je	28	·74	2 Jl 3 Au	28 26	·27 ·80
4165	1121	986	23M	·3000	26·7491	17·171		1064	2 Ap	19●○	·05	3 My	18	·58	5 Je	17	·11	6 Jl	16	·64	1 Au	15	·17
4166	1122	987	23M	·5587	15·8574	13·328		1065	6 Ap	8	·42	7 My	7	·95	2 Je	6	·48	4 Jl	6	·01	5 Au	4	·54
4167	1123	988	23M	·8175	4·9657	9·485		1066	3 Mr	28	·78	5 Ap	27	·31	6 My 1 Je	26 25	·84 ·37	2 Jl	24	·91	4 Au	23○	·44
4168	1124	989	24M	·0763	23·6046	7·619		1067	2 Ap	16	·68	4 My	16	·21	5 Je	14	·74	7 Jl	14	·27	1 Au	12○	·80
4169	1125	990	23M	·3350	12·7129	3·776		1068	7 Ap	5	·05	1 My	4	·58	3 Je	3	·11	4 Jl	2	·64	6 Au	1○	·17
4170	1126	991	23M	·5938	1·8212	27·488		1069	4 Mr	25	·41	5 Ap 7 My	23 23	·95 ·48	2 Je	22	·01	3 Jl	21●	·54	5 Au	20	·07
4171	1127	992	23M	·8525	20·4601	25·621		1070	3 Ap	13	·31	4 My	12	·84	6 Je	11○	·37	7 Jl	10●	·90	2 Au	9	·43
4172	1128	993	24M	·1113	9·5684	21·778		1071	7 Ap	2	·68	2 My	2	·21	3 My	31○	·74	5 Je	30	·27	6 Jl	29	·80
4173	1129	994	23M	·3700	28·2073	19·912		1072	6 Ap	20	·58	1 My	20	·11	2 Je	18	·64	4 Jl	18	·17	5 Au	16	·70
4174	1130	995	23M	·6288	17·3156	16·069		1073	3 Ap	9○	·94	5 My	9●	·47	7 Je	8	·00	1 Jl	7	·54	3 Au	6	·07
4175	1131	996	23M	·8876	6·4239	12·226		1074	1 Mr	30○	·31	2 Ap	28●	·84	4 My	28	·37	5 Je 7 Jl	26 26	·90 ·43	1 Au	24	·96
4176	1132	997	24M	·1463	25·0628	10·359		1075	7 Ap	18	·21	1 My	17	·74	3 Je	16	·27	4 Jl	15	·80	6 Au	14	·33
4177	1133	998	23M	·4051	14·1711	8·517		1076	4 Ap	6	·58	6 My	6	·11	7 Je	4	·64	2 Jl	4	·17	3 Au	2	·70
4178	1134	999	23M	·6838	3·2794	2·674		1077	1 Mr	26	·94	3 Ap 5 My	25 25	·47 ·00	6 Je	23	·53	1 Jl	23○	·06	2 Au	21	·60
4179	1135	1000	23M	·9226	21·9188	0·807		1078	7 Ap	14	·84	2 My	14	·37	3 Je	12	·90	5 Jl	12○	·43	6 Au	10	·96
4180	1136	1001	24M	·1813	11·0266	24·519		1079	5 Ap	4	·21	6 My	3	·74	1 Je	2	·27	2 Jl	1●	·80	4 Jl	31	·33
4181	1137	1002	23M	·4401	0·1849	20·676		1080	2 Mr 4 Ap	23 22	·57 ·10	5 My	21○	·64	7 Je	20●	·17	1 Jl	19	·70	3 Au	18	·23
4182	1138	1003	23M	·6988	18·7738	18·809		1081	1 Ap	11	·47	3 My	11○	·00	4 Je	9	·58	6 Jl	9	·06	7 Au	7	·59
4183	1139	1004	23M	·9576	7·8820	14·967		1082	5 Mr	31	·84	7 Ap	30○	·37	1 My	29	·90	3 Je	28	·43	4 Jl 6 Au	27 26	·96 ·49
4184	1140	1005	24M	·2164	29·5209	13·100		1083	4 Ap	19	·74	6 My	19	·27	7 Je	17	·80	2 Jl	17	·33	3 Au	15	·86
4185	1141	1006	23M	·4751	15·6292	9·257		1084	2 Ap	8	·10	3 My	7	·63	5 Je	6	·16	6 Jl	5	·70	1 Au	4	·23
4186	1142	1007	23M	·7839	4·7375	5·414		1085	6 Mr	28	·47	1 Ap	27	·00	2 My 4 Je	26 25	·53 ·06	5 Jl	24	·59	7 Au	23○	·12
4187	1143	1008	23M	·9926	23·3764	8·548		1086	5 Ap	16	·37	6 My	15	·90	1 Je	14	·43	2 Jl	13	·96	4 Au	12●○	·49
4188	1144	1009	24M	·2514	12·4847	27·259		1087	2 Ap	5	·74	4 My	5	·27	5 Je	3	·80	7 Jl	3	·33	1 Au	1●	·86
4189	1145	1010	23M	·5101	1·5930	23·417		1088	7 Mr	25	·10	1 Ap 8 My	23 23	·68 ·16	4 Je	21○	·69	6 Jl	21	·22	7 Au	19	·76
4190	1146	1011	23M	·7689	20·2319	21·550		1089	6 Ap	18	·00	7 My	12	·53	2 Je	11●○	·06	3 Jl	10	·59	5 Au	9	·12
4191	1147	1012	24M	·0277	9·3402	17·707		1090	3 Ap	2	·37	4 My	1	·90	6 My	31	·43	7 Je	29	·96	2 Jl	29	·49
4192	1148	1013	24M	·2864	27·9791	15·840		1091	2 Ap	21○	·26	3 My	20●	·80	5 Je	19	·38	6 Jl	18	·86	1 Au	17	·39
4193	1149	1014	23M	·5452	17·0874	11·998		1092	6 Ap	9○	·63	1 My	9	·16	2 Je	7	·69	4 Jl	7	·22	5 Au	5	·75
4194	1150	1015	23M	·8039	6·1957	8·155		1093	4 Mr	30○	·08	5 Ap	28	·53	7 My	28	·06	1 Je 3 Jl	26 26	·59 ·12	4 Au	24	·65
4195	1151	1016	24M	·0627	24·8346	6·288		1094	2 Ap	17	·90	4 My	17	·43	5 Je	15	·96	7 Jl	15	·49	2 Au	14	·02
4196	1152	1017	24M	·3214	13·9429	2·445		1095	7 Ap	7	·26	1 My	6	·79	3 Je	5	·32	4 Jl	4	·86	6 Au	3○	·39
4197	1153	1018	23M	·5802	3·0512	26·157		1096	4 Mr	26	·63	6 Ap 7 My	25 24	·16 ·69	2 Je	23	·22	3 Jl	22○	·75	5 Au	21	·28
4198	1154	1019	23M	·8390	21·8901	24·291		1097	3 Ap	14	·53	5 My	14	·06	6 Je	12	·59	1 Jl	12	·12	2 Au	10	·65
4199	1155	1020	24M	·0977	10·7984	20·448		1098	7 Ap	3	·90	2 My	3	·43	3 Je	1	·96	5 Jl	1	·49	7 Jl	31	·02
4200	1156	1021	24M	·3565	29·4872	18·581		1099	5 Mr 6 Ap	24 22	·26 ·79	1 My	22○	·32	2 Je	20	·85	4 Jl	20	·38	5 Au	18	·92
4201	1157	1022	23M	·6152	18·5456	14·739		1100	4 Ap	11	·16	5 My	10●○	69	7 Je	9	·22	1 Jl	8	·75	3 Au	7	·28
4202	1158	1023	23M	·8740	7·6538	10·896		1101	1 Mr	31	·53	3 Ap	30●	·06	4 My	29	·59	6 Je	28	·12	7 Jl 2 Au	27 26	·65 ·18
4203	1159	1024	24M	·1327	26·2927	9·029		1102	7 Ap	19●	·42	1 My	18	·98	3 Je	17	·49	5 Jl	17	·02	6 Au	15	·55
4204	1160	1025	24M	·3915	15·4010	5·186		1103	4 Ap	8	·79	6 My	8	·32	7 Je	6	·85	2 Jl	6	·38	3 Au	4	·91
4205	1161	1026	23M	·6502	4·5093	1·344		1104	2 Mr	28	·16	3 Ap	26	·69	5 My 6 Je	26 24	·26 ·75	1 Jl	24	·28	2 Au	22○	·81
4206	1162	1027	23M	·9090	23·1482	27·031		1105	1 Ap	13	·06	2 My	15	·59	4 Je	14	·12	5 Jl	13	·65	7 Au	12	·18
4207	1163	1028	24M	·1678	12·2565	23·189		1106	5 Ap	5	·42	6 My	4	·95	1 Je	3	·48	3 Jl	3○	·02	4 Au	1●	·55
4208	1164	1029	24M	·4265	1·3648	19·846		1107	2 Mr	25	·79	4 Ap 5 My	24 23	·32 ·85	7 Je	22○	·38	1 Jl	21	·91	3 Au	20	·44

N.B.—For tithis by other siddhāntas add algebraically to

Sūrya siddhānta—*cont.*

Āśvina.				Kārttika.				Mārgaśīrsha.				Pausha.			A.D.	Māgha.				A.D.	Phālguna.				Chaitra.			
Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.	Week-day	Month.	Day.		Week-day.	Month.	Day.	Fraction.		Week-day	Month.	Day.	Fraction.	Week-day.	Month.	Day.	Fraction.
4	S	15	·54	6	O	15	·07	7	N	13●○	·60	2	D	13	·13	**54**	3	Jr	11	·66		5	F	10	·19	6	Mr	11	·73
1	S	4	·91	3	O	4	·44	4	N	2●	·97	6	D	2	·50	**55**	1	Jr	1	·03		2	Jr	30	·56	4	Mr	1	·09
7	S	23○	·81	2	O	23●	·34	3	N	21	·87	5	D	21	·40	**56**	6	Jr	19	·93		1	F	18	46	2	Mr	18○	·99
5	S	12●○	·17	6	O	11	·70	1	N	10	·23	2	D	9	·77	**57**	4	Jr	8	·30		5	F	6•	·83	7	Mr	8○	·36
2	S	1○	·54	4	O	1	·07	5	O	30	·60	7	N	29	·13		1	D	28	·66	**58**	3	Jr	27	·19	4	F	25	·72
1	S	20	·44	2	O	19	·97	4	N	18	·50	6	D	18	·03	**59**	7	Jr	18○	·56		2	F	15●	·09	3	Mr	16	·62
5	S	9	·81	7	O	9	·34	1	N	7	·87	3	D	7	·40	**60**	4	Jr	5○	·93		6	F	4	·46	7	Mr	4	·99
3	Au	29	·17	4	S	27	·70	6	O	37	·23	7	N	25	·76		2	D	25○	·29	**61**	3	Jr	28	·83	5	F	22	·36
2	S	17	·07	3	O	16	·60	5	N	15	·13	6	D	14	·66	**62**	1	Jr	13	·19		2	F	11	·72	4	Mr	13	·25
6	S	6	·44	7	O	5	·97	2	N	4○	·50	4	D	4	·03	**63**	5	Jr	2	·56		7	F	1	·09	1	Mr	2	·62
5	S	25	·33	6	O	24○	·87	1	N	23	·40	2	D	22	·93	**64**	4	Jr	21	·46		5	F	19	·99	7	Mr	20	·52
2	S	13	·70	4	O	13●○	·23	5	N	11	·76	7	D	11	·29	**65**	1	Jr	9	·82		3	F	8	·35	4	Mr	9	·89
7	S	3	·07	1	O	2	·60	3	N	1	·13	4	N	30	·66		6	D	30	·19	**66**	7	Jr	28	·72	2	F	27○	·25
5	S	21●	·97	7	O	21	·50	2	N	20	·03	3	D	19	·56	**67**	5	Jr	18	·09		6	F	16○	·62	1	Mr	18	·15
3	S	11	·33	1	O	10	·86	6	N	9	·39	7	D	8	·93	**68**	2	Jr	7	·46		3	F	5●○	·99	5	Mr	6	·52
7	Au	30	·70	2	S	29	·23	3	O	28	·76	5	N	27	·29		6	D	26	·82	**69**	1	Jr	25	·35	2	F	23	·88
6	S	18	·60	1	O	18	·13	2	N	16	·66	4	D	16○	·19	**70**	5	Jr	14	·72		7	F	13	·25	1	Mr	14	·78
3	S	7	·97	5	O	7	·50	7	N	6	·03	1	D	5○	·56	**71**	3	Jr	4	·09		4	F	2	·62	6	Mr	4	·15
1	Au	28	·33	4	O	26	·39	5	N	24○	·92	7	D	24	·45	**72**	1	Jr	22	·98		3	F	21	·52	5	Mr	22	·05
2	S	26	·86																										
7	S	15	·23	1	O	14	·76	3	N	13	·29	4	D	12	·82	**73**	6	Jr	11	·35		7	F	9	·88	2	Mr	11	·41
4	S	4	·60	6	O	4○	·13	7	N	2	·66	2	D	2	·19		3	D	31	·72	**74**	5	Jr	30	·25	6	F	28	·78
3	S	23○	·49	5	O	23	·02	6	N	21	·56	1	D	21	·09	**75**	2	Jr	19	·62		4	F	18	·15	5	Mr	19●○	·68
7	S	12●○	·86	2	O	12	·39	3	N	10	·92	5	D	10	·45	**76**	6	Jr	8	·98		1	F	7	·51	3	Mr	8	
5	S	1●	·23	6	S	30	·76	1	O	30	·29	2	N	28	·82		4	D	28	·35	**77**	5	Jr	26○	·88	7	F	25	·04
4	S	20	·13	5	O	19	·66	7	N	18	·19	1	D	17	·72	**78**	3	Jr	16○	·25		4	F	14	·78	6	Mr	16	·41 ·31
1	S	9	·49	3	O	9	·02	4	N	7	·55	6	D	7	·08	**79**	7	Jr	5○	·61		2	F	4	·15	3	Mr	5	·68
5	Au	29	·86	7	S	28	·39	1	O	27	·92	3	N	26	·45		4	D	25●	·98	**80**	6	Jr	24	·51	1	F	23	·04
4	S	16	·76	6	O	16	·29	7	N	14○	·82	2	D	14●	·35	**81**	3	Jr	12	·88		5	F	11	·41	6	Mr	12	·94
2	S	6	·12	3	O	5	·66	5	N	4○	·19	6	D	3●	·72	**82**	1	Jr	2	·25		2	Jr	31	·78	4	Mr	2	·81
1	S	25	·02	2	O	24○	·55	4	N	23	·08	5	D	22	·61	**83**	7	Jr	21	·14		1	F	19	·68	3	Mr	21	·21
5	S	14	·39	6	O	13●	·92	1	N	12	·45	2	D	11	·98	**84**	4	Jr	10	·51		6	F	9	·04	7	Mr	9○	·57
2	S	2○	·76	4	O	2	·29	5	O	31	·82	7	N	30	·35		1	D	29	·88	**85**	3	Jr	28	·41	4	F	26○	·94
1	S	21	·65	3	O	21	·18	4	N	19	·72	6	D	19	·25	**86**	7	Jr	17	·78		2	F	16○	·31	3	Mr	17	·84
6	S	11	·02	7	O	10	·55	2	N	9	·08	3	D	8	·61	**87**	5	Jr	7	·14		6	F	5●	·67	1	Mr	7	·20
3	Au	31	·39	4	S	29	·92	6	O	29	·45	7	N	27	·98		2	D	27○	·51	**88**	4	Jr	26	·04	5	F	24	·57
2	S	18	·29	3	O	17	·82	5	N	16	·35	6	D	15○	·88	**89**	1	Jr	14	·41		2	F	12	·94	4	Mr	14	·47
6	S	7	·65	1	O	7	·18	2	N	5	·71	4	D	5○	·24	**90**	5	Jr	3	·78		7	F	2	·31	1	Mr	3	·84
4	Au	28	·02	7	O	26	·08	1	N	24●	·61	3	D	24	·14	**91**	4	Jr	22	·67		6	F	21	·20	7	Mr	22	·73
5	S	26	·55																										
2	S	15	·92	4	O	15○	·45	5	N	13	·98	7	D	13	·51	**92**	2	Jr	12	·04		3	F	10	·57	5	Mr	11	·10
7	S	4	·28	1	O	3○	·82	3	N	2	·35	4	D	1	·88		6	D	31	·41	**93**	7	Jr	29	·94	2	F	28	·47
6	S	23●○	·18	7	O	22	·71	2	N	21	·24	3	D	20	·77	**94**	5	Jr	19	·30		6	F	17	·84	1	Mr	19●	·87
3	S	12	·55	5	O	12	·08	6	N	10	·61	1	D	10	·14	**95**	2	Jr	8	·67		4	F	7○	·20	5	Mr	8	·73
7	S	1	·92	2	O	1	·45	3	O	30	·98	5	N	29	·51		7	D	29	·04	**96**	1	Jr	27○	·57	3	F	26	·10
6	S	19	·81	1	O	19	·34	2	N	17	·88	4	D	17	·41	**97**	5	Jr	15●○	·94		7	F	14	·47	2	Mr	16	·00
4	S	9	·18	5	O	8	·71	7	N	7	·24	1	D	6	·77	**98**	3	Jr	5●	·30		4	F	3	·83	6	Mr	5	·36
1	Au	29	·55	3	S	28	·08	4	O	27	·61	6	N	26○	·14		7	D	25	·67	**99**	2	Jr	24	·20	3	F	22	·73
7	S	17	·45	1	O	16	·98	3	N	15○	·51	5	D	15	·04	**11**	6	Jr	13	·57	**00**	1	F	12	·10	2	Mr	12	·68
4	S	5	·81	6	O	5	·34	7	N	3○	·87	2	D	3	·40	**01**	3	Jr	1	·94		5	Jr	31	·47	7	Mr	2	·00
3	S	24	·71	5	O	24●	·24	6	N	22	·77	1	D	22	·30	**02**	2	Jr	20	·83		4	F	19	·36	5	Mr	20○	·89
1	S	14○	·08	2	O	13	·61	4	N	12	·14	5	D	11	·67	**03**	7	Jr	10	·20		1	F	8	·73	3	Mr	10●○	·26
5	S	3○	·44	6	O	2	·98	1	N	1	·51	3	D	1	·04		4	D	30	·57	**04**	6	Jr	29	·10	7	F	27○	·63
4	S	21	·34	5	O	20	·87	7	N	19	·40	1	D	18	·93	**05**	3	Jr	17	·46		5	F	16	·00	6	Mr	17	·53
1	S	10	·71	3	O	10	·24	4	N	8	·77	6	D	8	·30	**06**	7	Jr	6○	·83		2	F	5	·36	3	Mr	6	·89
6	Au	31	·08	7	S	29	·61	2	O	29	·14	3	N	27	·67		5	D	27●○	·20	**07**	6	Jr	25	·73	1	F	24	·26
4	S	18	·97	6	O	18	·50	1	N	17	·04	2	D	16●○	·56	**08**	4	Jr	15	·10		5	F	13	·63	7	Mr	14	·16

the above + ·01 for Ārya siddhānta and — ·05 for Brahma siddhānta.